SPECIAL { THE WORK OF MUNICIPALITIES—Papers and Reports Read at Meeting of American Society of Municipal Improvements

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PAVING SEWERAGE

# MUNICIPAL ENGINEERING

WATERWORKS PARKS

A MONTHLY MAGAZINE.

DEVOTED TO THE IMPROVEMENT OF CITIES.

GOOD ROADS, STREET CONSTRUCTION,
CLEANING AND LIGHTING,
SANITATION,
BRIDGES.

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# ASPHALT PAVEMENTS

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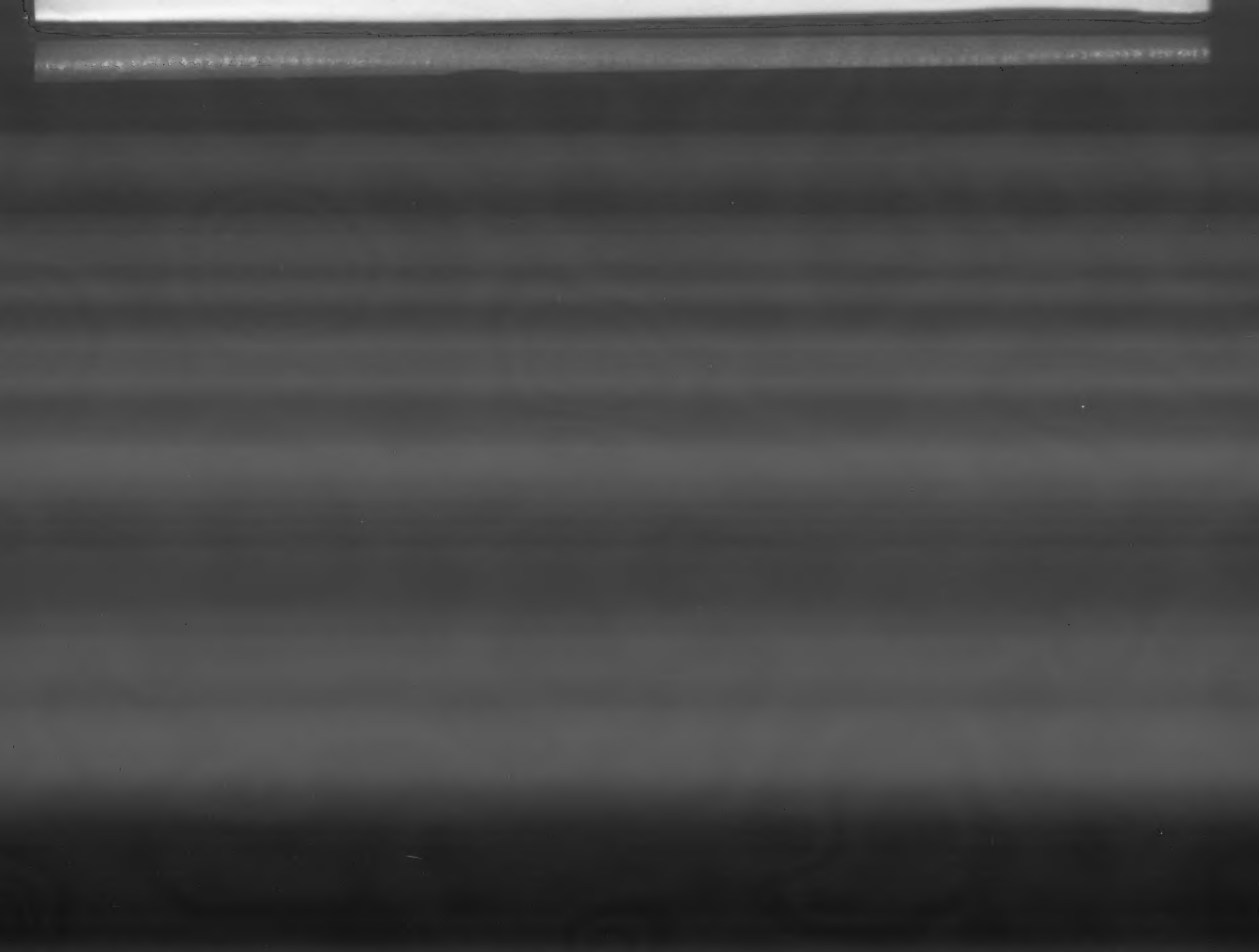

# Municipal Engineering

VOLUME XV. NOVEMBER, EIGHTEEN NINETY-EIGHT. NUMBER 5.

## THE WORK OF MUNICIPALITIES.

### THE SUBJECTS CONSIDERED AT THE FIFTH ANNUAL MEETING OF THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS IN WASHINGTON, D. C.

The fifth annual convention of the American Society of Municipal Improvements assembled in Washington, D. C., on October 26, and was opened with an address of welcome by President Wight, of the Engineer Commission of Washington, to which President Harrison Van Duyne responded. In referring to the great events of the year, he said:

The general government has had a severe experience this year with the dangers arising from assembling large bodies of men together, and has found that the best possible sanitary arrangements must be made to protect their health. People crowd into our cities, and the members of this society, representing, as they do, the governing and working power of so many cities, have a special responsibility resting upon them. Are the streets and avenues of your city in good condition, and are they kept clean? Is your city properly sewered, and have you a water supply uncontaminated and kept in such condition that your health and that of your families is not endangered by drinking it? In answering these questions, we realize how much the health and comfort of the hundreds of thousands of people we represent is placed in our care.

We come together once a year to listen to the reading of carefully prepared papers by some of our members on the various subjects relating to city improvements, and in the discussions which follow the actual experience of the different cities is clearly brought out, but in addition to that, the visits made by us each year to a different one of our larger cities, enabling us to study on the ground the best work done in each, give us all an experience and training that must be of great advantage to the city we represent.

Our first meeting was held in Buffalo, probably the first city in this country to decide that smoothly paved and clean streets were a necessity; and its citizens and officials must have had the courage of their convictions to show by their example what a progressive city could do.

Three years ago we met in Cincinnati, an ideal convention city, built on its seven hills, its incline planes and stationary engines making easy access to their very top. Miles of finely paved streets and its extensive sewer construction showed it to be another of our very progressive cities, and in its hospitality it could not easily be excelled.

Two years ago we were in Chicago, that marvel of the west, with its beautiful parks and fine suburban drives. To improve its sewer system it has not hesitated to change the course of a river, and some day it will be at the head of navigation of the Mississippi.

Last year we were at Nashville, Tenn., a city with energy enough to successfully carry on a great exposition, and which will easily in its improvements rank as one of the foremost cities of the south, and this year we come to the National Capitol, the city in which we all feel a personal interest and a special pride, and in passing through its finely paved streets and avenues, and in admiring its beautiful parks and public grounds, we fully realize that thoroughly trained and conscientious men are at the head of the public work in Washington.

Mr. Van Duyne spoke of the application to his own city (Newark, N. J.) of some of the lessons at the Nashville convention, mentioning particularly the recommendation of the committee on street paving, that where a contractor was required to guarantee his work for a term of years, the condition of the pave-

ment at the end of the term should be specifically stated. Newark now requires a ten-year guarantee under bonds given by a responsible trust company and the exact condition in which the pavement is to be at the end of that term is stated. The price of asphalt paving in Newark has declined, he stated, from $2.85 per square yard in 1894, to $2.35 last year, and $1.50 this year, but the city agrees to pay in addition 25 cents per yard for the second term of five years for maintenance and repairs. A first year guarantee on oblong granite block pavement is required, notwithstanding which the price has been reduced from about $2.50 per yard in 1893 to $1.50 this year, when laid on sand and in like proportion when laid on concrete. "Perhaps I should add," he explains, "that New York City, only nine miles away, stopped almost entirely its paving work this year and that may have helped to reduce the price to neighboring cities." Continuing, he said:

In all our progressive cities—and we all want to be considered progressive—the conditions are now entirely different from fifteen years ago. Even Washington at that time or a little earlier had an unenviable reputation for the condition of its streets, and a number of other cities gloried in their cobblestone pavements. But the great advance made during the last few years in city development has taken a large amount of money, the annual outlay for expenses has been greatly increased, municipal bonds are becoming a burden, and as a natural result there is such an increase in the tax rate as to cause alarm to many citizens. During this same time in all our cities a wonderful advance has also taken place in the value of the franchises which have been given to so many companies, to use the public streets to carry on their business.

These franchises are worth nearly as much as the land fronting on the streets through which their grants and privileges extend. They have a recognized value to buy and sell and their earnings and dividends bear out that value; but when it comes to the valuation on which they pay taxes there is a wonderful drop, and the result is that they bear only a small part of the public burdens that properly belong to them, and the tax burdens of others are proportionally increased. I know of no reason why, according to the true value of these properties, they should not contribute their share to the support of the public schools, to the cost of maintaining our courts and all the other expenses of city and state government the same as other property. True, in nearly all cases these franchises were given away as if they had no value, but is that any reason why, after their enormous value is fully established, they should not be treated as other property and annually contribute their full share to the tax collector?

Beyond our churches and schools and charitable institutions, we want no favored class, and our influence should be exerted to see that all property stands equally before the law.

The routine business of official reports followed the president's address, occupying the remainder of the morning session. At the subsequent sessions committee reports were submitted, and papers were read, of which a number of the more important are published in full in this number of MUNICIPAL ENGINEERING, by special arrangement, as the meeting occurred simultaneously with the sending to press of the forms for this issue.

The program embraced the following:

Report of the Committee on Electric Street Lighting, by F. W. Cappelen, city engineer of Minneapolis.

Report on the Utilization of Sewage of Vienna—a translation by the chairman of the committee on Sewerage and Sanitation, Capt. Lansing H. Beach, engineer commissioner of Washington, D. C.

"The Sewerage of Baltimore," by Kenneth Allen, C. E., principal assistant engineer of the sewerage commission of Baltimore.

"Proposed Sewage Disposal System for Washington, D. C.," by D. E. McComb, superintendent of sewers, Washington, D. C.

Report of Committee on Taxation and Assessment, by August Herrmann, chairman, Cincinnati.

Report of the Committee on Waterworks and Water Supply, by M. L. Holman, chairman, St. Louis.

"The Construction of Surface Railroad Tracks in Paved Streets," by N. P. Lewis, of Brooklyn, N. Y., chairman of committee on street paving.

"The Proper Curbing of Street," by Horace Andrews, city engineer, Albany, N. Y.

"A Street Extension Plan for the Dis-

EAST BATTERY STREET, CHARLESTON, S. C., PAVED WITH ASPHALT.

trict of Columbia," by William P. Richards, assistant engineer, Washington, D. C.

"Relative Values of Paving Material," by Geo. W. Tillson, C. E., Brooklyn, N. Y.

"Tree Planting in the Streets of Washington," by William P. Richards, Washington, D. C.

"Street Cleaning and Disposition of Garbage," by Dr. J. L. Hess, Cleveland, chairman of committee.

Report on Municipal Data, by Charles Carroll Brown, C. E., chairman of committee.

Report on Municipal Franchises, by Andrew Rosewater, city engineer, Omaha, Neb., chairman of committee.

Report on Coating of Cast Iron and Steel Riveted Pipes, by L. W. Rundlett, city engineer, St. Paul, Minn., chairman of committee.

"Electrolysis Tests at Dayton, O.," by Harold P. Brown, electrical engineer, New York, N. Y., chairman of committee on electrolysis.

"Some Data on the Subject of Electrolysis in the City of Davenport, Iowa," by E. W. Boynton, commissioner of public works, Davenport, Iowa.

Report of the committee on review, by Geo. H. Benzenberg, city engineer and president of board of public works, Milwaukee, Wis.

The local committee, on behalf of the commissioners and citizens of the District of Columbia, arranged for an excursion on the Potomac river to Mount Vernon and Marshall Hall on Friday. Arrangements were also made for the members to call in a body on President McKinley at the White House.

Committee reports and papers read during the sessions of the Society follow this outline of the proceedings.

## ELECTRIC STREET LIGHTING IN AMERICAN CITIES.

Mr. F. W. Cappelen, chairman of the Committee on Electric Street Lighting, paid a compliment to the intelligent and efficient work of his predecessor, Mr. J. A. Cabot, the former chairman, and said: "As Mr. Cabot stated last year, it is a very unsatisfactory task to obtain proper information through correspondence, but as this appears to be the only method, your committee, particularly Mr. Hunter, of Allegheny, and your humble servant, entered into correspondence with all the cities, some 180, which in 1896 answered the committee's inquiries. Your committee desired particularly to find out if any changes in prices per lamp per year had taken place during the last two years. It is, therefore, a pleasure to be able to report that reductions have been made in a number of cities. (See Table No. 1.)

"It will be seen that an increase has taken place in four cities with a reduction of contract time, while a reduction has been made in twenty-seven cities, but not always has the contract time been increased.

"For all the other cities included in the comprehensive table published by this society in the annual report of 1896 no changes have taken place; hence, it is useless to cause a repetition of said table to be printed.

"Last year the committee on electric lighting caused the statistics gathered by the General Electric Company of Schenectady to be printed in the annual report for 1897 without comment. The averages that can be deducted from said report check very well in general with similar averages obtained from your committee's report in '96. But it will probably be rather surprising to you to learn that said General Electric Company's statistics do not, as far as can be found, contain the figures of cost, etc., pertaining to a single city owning and operating its own municipal plant. It, of course, may be that the General Electric Company simply wanted to show contract figures without bothering with statistics from cities owning their own plants. The following cities operate their own plants to-day. (See Table No. 2.)

The committee notes that the

## TABLE NO. 1.

### 2,000 CANDLE POWER LAMPS.

| CITY. | SCHEDULE. | Price in 1896 | Price in 1898 | Contract period before. | Contract period at present. |
|---|---|---|---|---|---|
| Boulder, Colo. | All night | $108.00 | $ 96.00 | 2 | 5 |
| Greely, Colo. | To midnight | 150.00 | 93.00 | 5 | 1 |
| Galesburg, Ills. | Moonlight | 135.00 | 75 00 | ..... | 1 |
| Joliet, Ills. | All night. | 100.00 | 90.00 | ..... | 5 |
| Frankford, Ky | All night. | 68 00 | 80.00 | 5 | 3 |
| Keokuk, Iowa | Moon. | 68.00 | 75.00 | 10 | 5 |
| Saginaw, Mich | All night. | 105.00 | 95.00 | 5 | 3 |
| Minneapolis, Minn. | All night. | 150.00 | 118.00 | 1 | 1 |
| Minneapolis, Minn. | Moon. | 125.00 | 100.00 | 1 | 1 |
| Red Wing, Minn | Moon. | 144.00 | 90.00 | 0 | 3 |
| St. Cloud, Minn. | All night. | 120.00 | 80.00 | ..... | 1 |
| Marshall, Mo. | Moon | 80.00 | 60.00 | 3 | 1 |
| Fall River, Mass. | All night. | 159.85 | 131.40 | 4 | 5 |
| Worcester, Mass. | All night. | 127.75 | 116.80 | 3 | 3 |
| Omaha, Neb | All night. | 120.00 | 114.50 | 2 | 6 |
| Glen Falls, N. Y. | All night. | 109.50 | 91.25 | 3 | 5 |
| Utica, N. Y. | All night. | 127.75 | 124.00 | 2 | 5 |
| Lorain, O. | Moon. | 60.00 | 65.00 | 0 | 5 |
| Philadelphia, Pa | All night. | 128 00 | 119.01 | ..... | 1 |
| Dalas, Texas | Moon | 90.00 | 75.00 | 3 | 1 |
| Montpelier, Vt. | | 78.00 | 43.00 | 1 | 3 |

### 1,200 CANDLE POWER LAMPS.

| | | | | | |
|---|---|---|---|---|---|
| New Haven, Con. | All night. | 109.00 | 98.55 | 3 | 3 |
| Pittsfield, Mass | All Night. | 100.00 | 95.00 | ..... | Moon. |
| | Moon | 65.00 | 62.00 | | |
| Cambridge, Mass. | All night. | 115.00 | 100 00 | 1 | 1 |
| Summerville, Mass. | All night. | 120.00 | 110.00 | 5 | 0 |
| Butte, Mont. | Moon | 168.00 | 141.00 | 0 | 3 |
| Hudson, N. Y. | All night. | 114.00 | 108.00 | 4 | 5 |
| N. Tonawanda N. Y. | All night. | 78.00 | 84.61 | 5 | 1 |
| Brooklyn, N. Y. | All night. | 127.75 | 124.10 | 1 | 1 |
| Watertown, Wis. | Moon. | 66.00 | 55.00 | 2 | 3 |

## TABLE No. 2.

| PLANT | No. Lamps | Candle Power | Schedule | Cost per year | Cost of plant | Cost of Plant per lmp |
|---|---|---|---|---|---|---|
| Prescott, Arizona | 209 | 2000 | Moonlight | $ 41.27 | $ 35.000 | $169 |
| South Norwalk, Conn. | 100 | 2000 | Moonlight | 60.22 | 14,000 | 140 |
| ‡Jacksonville, Fla. | 375 | 2000 | All Night | 90.00 | 140,000 | 373 |
| Bloomington, Ill. | 300 | 2000 | Moonlight | 60.00 | 83,000 | 277 |
| Chicago, Ill. | .... | 2000 | All Night | 100.00 | ..... | .... |
| Champaign, Ill. | 72 | 2000 | Moonlight | 64.30 | ..... | .... |
| La Belle, Ill. | 98 | 2000 | Moonlight | 46.00 | 12,400 | 126 |
| Ottawa, Ill. | 133 | 2000 | All Night | 57 50 | ..... | .... |
| Kendalville, Ind. | 60 | 2000 | All Night | 30.00 | 8,000 | 133 |
| Topeka, Kans. | 184 | 2000 | Moonlight | 56.21 | 47,000 | 255 |
| Emporia, Kans | 57 | 2000 | All Night | 108.00 | ..... | .... |
| Bangor, Me. | 152 | 2000 | All Night | 45.00 | 40,000 | 263 |
| Reading, Mass. | 158 | 1200 | All Night | 65.00 | 35,000 | 221 |
| Bay City, Mich. | 181 | 2000 | All Night | 49.00 | 32,674 | 180 |
| Detroit, Mich | 1744 | 2000 | All Night | 83.50 | 750,000 | .... |
| Savannah, Mo. | 26 | 1200 | Special | 37.78 | 12,000 | 461 |
| St. Joseph, Mo. | 369 | 2000 | Moonlight | 57.00 | 92,000 | 249 |
| Dunkirk, N. Y. | 75 | 2000 | Moonlight | 45.50 | 21,000 | 280 |
| Fredonia, N. Y. | 58 | 2000 | Moonlight | 42.00 | ..... | .... |
| Hamilton, O. | 216 | 2000 | All Night | 75 00 | 100,000 | 463 |
| Columbus, O. | 390 | 2000 | All Night | 74.50 | ..... | .... |
| Marietta, O. | 112 | 2000 | Moonlight | 39.00 | 18,000 | 160 |
| Martin's Ferry, O. | 100 | 2000 | Moonlight | ..... | 21,000 | 210 |
| Tacoma, Wash | .... | .... | ..... | 100.00 | ..... | .... |
| §Fort Worth, Tex. | 68 | 2000 | Moonlight | 64.48 | 44,000 | 647 |

‡Also provides for 320 32-candle power incandescent lamps.
§Also provides for 400 32-candle power incandescent lamps.
Ottawa price includes 10 per cent. for interest and depreciation.
Bangor price includes 4 per cent. for interest.
Hamilton price includes interest and depreciation.
Fort Worth price includes 6 per cent. for interest.

prices are very low, but says it is very difficult to get the right information as to what is included in the price per lamp. Particular attention is called to Detroit and editorial discussions of its recent report. It was suggested that the convention particularly discuss the questions of interest, depreciation and taxation in connection with municipal ownership of lighting plants. These features, it was stated, had probably received more thorough consideration than had been given before at any other point in the country in the last contract for electric lighting between the city of Boston and the Boston Electric Light Co. In Boston it was decided that 7 per cent. on the entire investment exclusive of land should be allowed for depreciation. Mr. Cappelen, in his estimate of cost for a municipal plant in Minneapolis, had considered 6 per cent. a fair allowance for depreciation, but did not consider insurance, which, he thought, should be done.

Mr. Cappelen, in concluding his report, said that he thought much credit was due the American Society of Municipal Improvements for the reduction in the cost of electric street lighting throughout the country.

## THE PROPER CURBING OF STREETS.

*By Horace Andrews, M. Am. Soc. C. E., City Engineer of Albany, N. Y.*

The methods of improving city streets have attained such a degree of development that further progress towards perfection must be necessarily slow and can best be assured by a careful examination of each item entering into street construction.

We can realize the present excellence of modern streets by looking backward to the times, not so very remote, when the condition of the streets in London was far worse than anything we would now tolerate. At the close of the reign of Charles the Second, about 1685, when London was a city of about 500,000 inhabitants, its streets were in a state thus graphically described by a distinguished historian: "The pavement was detestable. * * The drainage was so bad that in rainy weather the gutters soon became torrents. * * This flood was profusely thrown to right and left by coaches and carts. To keep as far from the carriage road as possible was, therefore, the wish of every pedestrian. The mild and timid gave the wall; the bold and athletic took it."

The conditions depicted are sufficiently appalling, and we might anticipate that the rapid advance of civilization would soon lead to radical reform. However, at a date eighty years later, so little progress had been made that we find the state of London streets described as follows: "Foot passengers are protected by rows of posts at intervals four or five feet. Flat paving stones are not in general use and those that have been laid down are small and insecure. * * The only pavement, both for the road and the footway, consisted of large round pebbles, over which the rolling of the vehicles made the most dreadful noise. In the year 1762 however, an improvement was introduced in Westminster, followed by

LAYING AN ASPHALT PAVEMENT ON SOUTH BATTERY STREET IN CHARLESTON, S. C.

the city of London in 1766. The roads were paved with squares of Scotch granite laid in gravel; the posts were removed; a curb was laid down; gutters provided and the footway paved with flat stones."

Here we see the beginnings of our present raised sidewalks and can realize the painful inconvenience, endured for so many years, on account of their absence.

To retain the sidewalk at its proper elevation and to help form the gutter, the curbstone was used. It is the purpose of the writer to call attention to this detail of street construction to which, frequently, little thought seems to be devoted.

The functions of a curbstone are such that great stability should be insured, yet we often perceive that both permanence and strength are disregarded. Frequently specifications for pavement of the roadway call for excellent and expensive work, while the curbstone is either left to be furnished without extra cost, as an incidental, or a stone of most insufficient size is specified. A recent specification for sheet asphalt pavement in the streets of one of our large cities calls for a curbstone three inches thick, in lengths of four feet or over, and of such depth as to extend four inches below the surface of the pavement at the gutter, no special foundation being mentioned.

Let us consider the disturbing forces that tend to displace the curb and destroy its alignment. The pressure of the earth behind the curb, frequently augmented by the heavy surcharges from piles of merchandise on the sidewalk, tends to overturn it. This pressure also tends to break the curb transversely or to cause it to slide bodily on its base. In our northern cities the most disturbing action is due to the freezing of the ground beneath the sidewalk. The pressure from the expansion of freezing earth behind the curb is most apt to occur where the sidewalk is partly sodded and the ground is accordingly moist. Successive freezings of the earth behind the curb will occasion a succession of thrusts forward till the curbstone, when of faulty design, is sometimes inclined 60° or more from the vertical.

The ground below the curb is also upheaved by frost at places where the subsoil can become saturated through percolations from the sidewalks or permeable pavements on the roadway. The displacement from beneath tends to alter the height of the curb and to impair its appearance seriously. It is of importance that the height of the curb should be permanently maintained, as it serves for the regulation of the cross-section of the roadway and sidewalks and for fixing the elevations of the houses. Where the sidewalks are sodded, and especially where the curb is of small cross-section and improperly supported, tile drainage may be of benefit. The writer has found it possible to secure stability without such drainage, even with sodded walks. Drainage may sometimes be a desirable safeguard, but great care should be exercised lest the soil should be so loosened in constructing the drain as to cause the curb to drop out of alignment. Posts and trees set too near the curbs tend to break and destroy the latter. Fires built in the gutters will deface and will seriously damage granite curb. The constant blows from wheels in narrow business streets will slowly destroy even the most substantial stone. To withstand the destructive impact of wheels, curbs are faced with iron

A VIEW OF DOUGLASS STREET, PAVED WITH ASPHALT, IN THE EXPOSITION CITY, OMAHA.

at certain places in the streets of London, and a concrete curb with a rounded edge of steel has been patented and used to some extent in this country.

The municipal engineer must seek a means of guarding against the destructive action of the various agents referred to, and at the same time he should endeavor to avoid an expenditure so great as to be oppressive. Where stone can be readily procured, the writer believes this to be the best material for the visible portion of the curbstone, and that the best kind of stone is granite of good quality. To render such curbing economical it should have a cross-section of moderate size; to insure its stability, it should be reinforced with concrete. For æsthetic considerations, the stone should be sufficiently well dressed to present a neat and uniform face and top surface. Granite has the advantage over most stone of looking well, even if somewhat roughly faced.

The comparative cheapness of concrete should lead to its liberal use, and in case stone is difficult to procure the entire curb may be formed of concrete. Such curb will never convey as good an impression as when formed of natural stone, nor will it resist the wear of vehicles as well. Concrete curbing must be made with extreme care and with the best materials; but concrete used merely for adding to the stability of a stone curb need not be of better quality than that employed for the pavement foundation.

The curbstone should have a thickness at least equal to the depth of the gutter in order not only to be stable but to appear so. In many cities abroad curbstone of as great a thickness as twelve inches is employed, and in Washington curbstones eight inches thick and eight inches deep are used. The occasional use of gutters of a depth of eight inches or greater, especially at receiving basins, might render a depth as small as eight inches insufficient. The writer is opposed to the use of a gutter stone. It is generally an unnecessary expense and the longitudinal joint between it and the pavement is much to be condemned. In narrow and heavily traveled streets every longitudinal joint having a length as great as one or two feet is sure to become a rut under the wheel traffic.

A concrete curb, with gutter formed in one piece, is admirably adapted to secure stability, but is open to objection for the reasons stated. The end joints of curbstones should be so cut as to look well from the top and front. They should be substantially square, but need not be cut precisely so for the entire thickness of the stone. In Liège, in Belgium, the curbstones, seven and one-half inches in width, are tongued and grooved at the ends, and a similar construction is seen in front of the Public Library in Boston. It is needless to say that such construction is merely an oddity, and is an unnecessary expense. The Liège curbstone is an interesting example of the development of one detail of street construction, with the neglect of others of greater importance; for in that city, the sidewalks, like the roadway, are paved with cubes of stone, four and a half inches on a side, concerning which a writer pathetically remarks: "One could wish himself shod in iron to escape the discomfort and pain caused by the inequality of these torturing cubes."

In setting the curbs it is well to keep the ends from actual contact. For this purpose strips of hoop-iron can be temporarily inserted be-

# THE CHANGE WROUGHT BY GOOD PAVEMENTS.

ELLIS AVENUE, CHICAGO, WHEN PAVED WITH MACADAM.

ELLIS AVENUE, CHICAGO, AFTER IT HAD BEEN RESURFACED WITH ASPHALT.

tween the ends of the curbs as they are set.

Specimen curbs should be placed on exhibition and referred to in the specifications. The pattern curbs should be dressed in every respect in accordance with what the engineer desires, and with due regard for what is practically attainable without excessive cost.

The foundation of the curb should be of concrete, having a depth of six inches. The depth of the curb should be such that the concrete under it will be nearly continuous with that under the street pavement.

The concrete placed behind the curb should have a thickness of six inches, and should be brought to a level surface, about three or four inches below the surface of the sidewalk. The layer of concrete under the pavement will then pass beneath and up behind the curbstone, affording an excellent support at a moderate cost; a cubic yard of concrete making foundation and backing for about thirty feet of curb. Concrete should have a slight excess of mortar, and should be composed of hydraulic cement, sand and stone in small pieces. It will then be possible to consolidate it without disturbing the alignment of the curb. A mold should always be formed for the concrete. For that beneath the curb a piece of 6x6 inch timber, placed in front of the bed, answers very well, and can be removed when the concrete is set. Boards, one inch thick, and left permanently in place, can be used for shaping the back of the concrete. Where a street is to be repaved the old curb may often be used to advantage in place of boards, for backing the concrete.

The lengths of the individual pieces of stone should not be less than three and one-half feet. Contractors usually furnish stones considerably longer than this, as the labor of dressing joints is thereby reduced.

The appearance of street corners is much helped and vehicle traffic is facilitated by the use of circular curb of large radius. The writer for several years used a radius of 5.73 feet, which gave a length of curb of a tenth of a foot for each degree of center angle. This radius has more recently been increased to eight feet.

The numerous driveways crossing the sidewalks should have small circular corners. For these a radius of about two feet is a convenient one. Where streets are not laid out on a rectangular system the angles which the curb lines make with one another should be carefully measured in advance and in all cases the circular curb should be cut to the proper length to join the tangents neatly.

In the city of Albany, N. Y., an effort has been made for several years to improve the quality and to increase the stability of the curb. The resulting appearance of the streets has been a source of satisfaction to the property-holders as well as to the city engineer.

About forty-seven miles of curbstone have been laid with concrete foundation. None of this curb exceeds fifteen inches in depth, yet its alignment is much better than that of the former twenty-inch curb on sand foundation. The first granite curb was laid, on concrete, in 1889. It was five inches thick and twelve inches deep, costing $1.25 per foot. The subsoil was blue clay, yet the curb has kept its height and alignment very well. The thickness of the standard curb is now six inches, the depth remaining twelve inches.

About 5½ miles of the five-inch granite curb have been laid while thirty miles of the 6x12-inch granite curb are now in place.

The granite curb as quarried costs about 22 cents per lineal foot delivered in Albany, coming by rail from Vermont and New Hampshire. Contractors have often laid it at prices too small to afford any profit, making up their loss on other items. Thus in 1897, 9.16 miles of 6x12-inch granite curb were laid at an average price of 39 cents per lineal foot for straight curb, and 47.7 cents for circular. This year 7.62 miles of the standard curb have been laid at an average price of 52.5 cents per foot for straight, and 76.4 cents for circular. The above prices include concrete and all incidental work.

Under the laws of the state of New York, all curbstones used by a municipality must be dressed within the limits of the state. Practically this requires all granite curb to be dressed within the city. The result in Albany has been a favorable one. The employment of citizens has met with popular approval. The opportunity of purchasing curb in its rough state is not confined to one or two quarries, whereas the number of quarries turning out dressed curb is very limited. The cost of the curb to the contractor has therefore been materially lessened since the passage of the law referred to.

In conclusion the writer would urge that substantial and handsome curbstone be used on all well-paved streets. Without such curbing the best pavement looks somewhat inferior and may be compared to a poorly-framed painting. Civic pride can only be aroused and municipal improvement can best be insured by special attention to those details that appeal most directly to the eye, and a proper curbstone is not an insignificant detail.

Appended to this paper are the usual specifications for curbstone at Albany, N. Y.

SPECIFICATIONS FOR CURBSTONES.

(1) *New Curbstones.*—All the new curb furnished and set shall be of the best quality of granite curb. All curbstones must be equal in quality to and have their faces dressed as well as the specimen granite curbstones, marked B. C., in the office of the city engineer, the front of the curb, when not self-faced and out of wind, to be pointed to a smooth face, the top to be axed to a plane surface. The stones to be in lengths of not less than three (3) feet six (6) inches, and to be six (6) inches in thickness, and of a depth of not less than twelve (12) inches; and if they exceed this depth by more than two (2) inches, extra excavation will be required, so that at least four (4) inches in depth of concrete shall be below the curb in every place. The face and upper edge are to be dressed to a line, and the top cut to a uniform bevel of one-quarter (¼) inch with the front. The front of the curb is to be smooth and to a fair line, without rounding and with no projection or depression exceeding one-quarter (¼) of an inch from the working line, and to be so dressed on the face from the top to the depth of nine (9) inches. The bottom to be roughed off, parallel to the top, to the full thickness of the stone. The ends from top to nine (9) inches below top line shall be truly squared and dressed, so that when laid and abutted, the one against the other, joints shall not exceed one-eighth (⅛) of an inch in width, for the depth of nine (9) inches from the top. Strips of hoop iron shall be placed between the ends of the curb to keep them slightly apart. These strips are to be removed after the curbs are set. The curb shall be set truly to the line and grades given by the city engineer. *At least two inches in thickness* of the curbstone, measuring from the front surface, shall be squarely dressed at the ends. The back of the curbstones must be dressed smooth, and even to a depth of two (2) inches below the top of the same.

(2) *Circular Curb.*—The corners of streets, driveways and alleys shall be provided with granite circular curb *cut with a radius* to be given by the city engineer. The curb must be furnished in the number of pieces to each corner that may be specified by the city engineer, such curb to be of the same width and thickness as the curb in the other portions of the street, and to be dressed and set in like manner. The joints must be cut truly radial. The entire length of circular curb at each corner, measured on the outer surface of the

curb, shall be exactly as the city engineer may direct.

(3) *Concrete Foundation for Curbstones.*—Concrete to be used as a foundation for the curbs shall be composed as follows, and mixed in the manner and with the proportions stated below: The contractor must provide a water-tight box or platform of sufficient size, and on this all concrete must be mixed. The contractor must provide two measuring boxes, one for the sand and one for the broken stone, these boxes to be of the dimensions given by the city engineer, and to be gauged and approved by him: the sand and broken stone for all concrete used shall be measured in these boxes, or in such other way as may be approved by the city engineer. In making the concrete, a mortar is first to be made, of one (1) barrel of freshly-burned Rosendale cement of the best quality, and equal to that used for the foundation for the pavement, eighty (80) pounds weight of such cement being taken as equal to one (1) cubic foot in volume, and one (1) box containing one and one-half (1½) barrels of clean, sharp sand; these ingredients shall be thoroughly mixed dry, and a moderate amount of water (about sixteen (16) gallons) shall afterwards be added to produce a paste of proper consistence. To the mortar, as above specified, shall be added one box, containing three (3) barrels of clean broken stone, *screened so as not to exceed one and one-half* (1½) *inches in greatest dimension* which shall be thoroughly freed from dirt and dust and be thoroughly wet before being added to the mortar. The whole mass shall be thoroughly turned over and mixed until every particle of stone is completely covered with mortar. The concrete material shall be turned over and mixed with shovels, by skilled workmen, upon the water-tight box or platform above mentioned, not less than four times before it is used. A piece of six-by-four or six-by-six-inch scantling shall be placed in front of the bed prepared for the concrete, which must be rapidly spread and *thoroughly rammed in place with a heavy rammer till free mortar appears on the surface.* After the ramming the scantling is to be removed. All mortar or concrete left in the boxes or platforms at the noon hour, or at night, or whenever concrete laying shall have been stopped for one hour, must be immediately thrown out and must not be used as a foundation for the curbstone.

All curbstones are to be laid on a bed of hydraulic cement concrete, made as above specified, twelve (12) inches in width and six (6) inches in thickness; said concrete to be also laid back of the curbstone to a width of six (6) inches and to a depth of ten (10) inches. The amount of concrete used for the foundation and backing of the curb to be eleven-twelfths (11-12) of one (1) cubic foot for each lineal foot of curbstone. For a distance of five (5) feet on each side of each receiving basin top the concrete is to extend back of the curbstone to a width of one (1) foot and to extend one (1) foot in depth below the bottom of the curbstone for the width of eighteen (18) inches. The concrete must be carefully filled into any open spaces in the end joints at the back of the curb. If necessary the joints must also be pointed in front with cement mortar. After the curb shall have been laid as herein specified and after the concrete backing shall have been tamped in place, Portland cement grout mixed as specified for grouting brick pavement shall be poured over the concrete backing until all the interstices and all open spaces at the ends of the curbstones, are thoroughly filled therewith. No sand or earth shall be placed on the concrete backing until it is grouted as herein specified.

(4) *Protection Curb.*—Where the new pavement adjoins a private driveway crossing the sidewalk, a line of protection curb will be set on edge along the curb line with its top surface one (1) inch above the bottom of the gutter. The protection curb will be formed of sound pieces of the present curb or other equally good measuring not less than three (3) inches thick, and fifteen (15) inches wide, to be furnished and set by the contractor, without extra charge therefor. The protection curb may be omitted where the driveways are to be paved with brick or stone blocks and where the adjoining granite or brick street pavement at intersecting streets is in good condition and to the satisfaction of the inspector. Similar protection curb must be furnished and set at all junctions between the contractor's brick pavement and cobble-stone pavement, or at unpaved streets or alleys; the top of such protection curb to be flush with the surface of the brick pavement.

(5) *Old Curb to be Reset.*—The old curb now on the street is to be reset behind the new curb and at a distance from it sufficient to allow the six (6) inches of concrete to be packed in between the curbs. The top of the old curb, as reset, or of boards used in place thereof, is to be two (2) inches below the top of the new curb. The contractor is not to remove any of the old curb from the street. No price will be paid for resetting curb as here provided. Where there is no old curb or the old curb has been removed by the owners, a mold for the concrete must be formed of boards which must be left in place permanently. For all such boards left permanently in place the sum of eighteen dollars ($18) per thousand feet B. M. will be allowed the contractors.

(6) *Extra Thick Curb.*—Wherever, on account of extra thickness of the curb, a six (6) inch space does not exist between the new and the old curb, as reset, the extra thickness of the curb will be taken as an equivalent for the concrete replaced by it.

(7) *Relaying Curb.*—Curbstones must be relaid, where directed, at the prices bid by the contractor. The same kind of founda-

tion, concrete or sand, must be used for the curb relaid, and in the same quantity, as that on which it was originally placed. Curbstones reset on curb lines with new concrete or sand foundation will be paid for in accordance with the contractor's bids for relaying curb. Curbstones reset, behind the new curb to form a mold, as heretofore provided, *will not* be paid for, the price for such resetting of curb being included in the contractor's bid for new curb.

## TREE PLANTING IN THE STREETS OF WASHINGTON.

*By William P. Richards, Surveyor of the District of Columbia.*

The selection, planting and care of all trees in the streets of Washington is under the direction of the District authorities. Individual preferences or private enterprises are not allowed to regulate this improvement as is generally done in other cities. Moreover, the city has its own nursery where seeds planted from its own trees grow and supply all the needed varieties.

In 1871, during the era of great municipal improvements, Governor A. R. Shepherd appointed a commission to regulate this important matter, and their efforts have brought about the beauty and uniformity of shade existing in Washington to-day. This commission acted in an advisory capacity and served without pay, the first one appointed being unchanged for twenty-five years. Its members were Mr. Wm. R. Smith, Superintendent of the Botanical Gardens, Mr. Wm. Saunders, Superintendent of Agricultural Grounds, and Mr. John Saul, a local nurseryman. During the last thirteen years Mr. Trueman Lanham has acted as chief executive officer of the commission, or superintendent of parking.

Under the guidance of these men tree planting has never been at an experimental stage, but an undertaking so great has, of course, had its lessons of experience. The qualities of a good curbstone tree were set forth in the annual report of the commission in 1872, as follows:

*First.* A somewhat compact stateliness and symmetry of growth, as distinguished from a low spreading or pendant form, so that the stem may reach a sufficient height to allow the free circulation of air below the branches.

*Second.* An ample supply of expansive foliage, of bright early spring verdure, and rich in the variety of colors and tints assumed during autumn.

*Third.* Healthiness, so far as being exempt from constitutional diseases, as well as by maladies frequently engendered by peculiarities of soil and atmosphere impurities.

*Fourth.* Cleanliness, characterized by a persistency of foliage during the summer, freedom from fading flowers, and exemption from the attacks of noxious insects.

*Fifth.* It should be easily transplanted, of moderately vigorous growth, and not inclined to throw up shoots from the roots or lower portions of the stem. A tree of extremely rapid growth is generally short-lived.

*Sixth.* The branches should be elastic rather than brittle that they may withstand heavy storms; and lastly there should be no offensive odors from foliage or flowers.

Of course, no tree planted amid the artificial conditions found in a city will fill such rigid requirements. This report of 1872 recommended as best the silver maple (*acer dasycarpum*), the American linden (*tilia Americana*), and European sycamore maple (*acer pseudo-platanus*). The American elm (*ulmus Americana*) was thought to fill all the requirements when not subjected to the attacks of insects. The tulip tree (*liviodendron tulipifera*), sugar maple (*acer saccharium*),

sweet gum (*liquidamber straciflua*), and the red maple (*acer rubrum*), were named as the most beautiful of trees, their only drawback being that of not growing freely after transplanting. The Norway maple (*acer platanoides*), the negundo (*acer negundo*), and the American ash (*fraxinus Americana*), were recommended for certain places. For wide avenues the buttonwoods (*platanus occidentalis* and *platanus orientalis*) were considered rapid-growing and effective trees.

Of late years some varieties have been planted that are not mentioned in the above, and others, once common, have been pronounced as poor street trees.

Washington was a city of young trees during the seventies, and in the spring of 1873 more than six thousand trees were planted, consisting of silver maples, Norway maples, American elms, American and European lindens, sugar maples, tulip trees, American white ash, scarlet maples, various poplars and ash-leaved maples.

From 1880 to 1888 the caterpillars were extremely numerous in the city and opportunity was had for observing which trees were mostly a prey to them. It was found that the white poplar and the negundo or ash-leaved maple were the first to be attacked and next the lindens, elms and sycamores (or western planes) and white ash. Those mostly exempt were the Carolina poplars, the sugar, silver and Norway maples, the tulip tree and honey locusts.

A careful count was made of the trees in 1887, and by comparing this with the number since planted and those removed there is found to be more than 78,000 trees, which if placed thirty feet apart would line both sides of a boulevard between Washington and New York. These consist of more than thirty varieties, but seven-eighths of the number may be placed in less than twelve varieties. The number, location and peculiarities of the principal trees may best be described separately.

The silver maple (*acer dasycarpum*) numbers about 25,000, or nearly four times any other variety. It is almost a perfect street tree, as it stands transplanting well, is a quite rapid grower and has beautiful foliage, which is never too heavy to allow free circulation of air. It loves moisture, but nevertheless stands seasons of drought better than many others. It can not attain at the curbstone the magnificent proportions that it has in the park or field and must be trimmed at times very severely. It is seldom attacked by the caterpillar, but some years ago a scale appeared on the trees that caused serious thoughts of their removal. This has since disappeared and the trees are in a healthy condition. It taught the lesson, however, that it is well not to have most trees of one variety. The most recent plantings of the silver maple may be seen on S street and good examples of severe trimming on Third street, N. W., and on T street, N. W., from Third to Fifth streets.

The Norway maple (*acer platanoides*) numbers about 5,000 trees and it is unfortunate that more of them were not planted in past years. They require considerable care in transplanting and are a little too thick in foliage. They are handsome in leaves and form and are of strong fiber, so that they withstand storms well. Insects seldom trouble them. Two splendid rows of them may be seen on Eighth street, N. W., above G street; on

Sixteenth street, N. W., above H street and on Thirteenth street, N. W., above K street.

The American elm (*ulmus Americana*) numbers about 5,000 trees planted on various avenues. It is a tree of spreading form so that, on roadways fifty feet wide, its limbs arch the entire space. From this it is liable to be split by storms. It presents a magnificent appearance at certain times of the year, but the elm-leaf beetle has preyed so constantly on this tree that it is either doomed to disappear as a street tree or else be limited to a small number. New Jersey, New York, New Hampshire and Rhode Island avenues are planted with this tree.

The buttonwood, sycamore or plane tree (*plantanus orientalis and occidentalis*) number 5,000 trees. It is a tree of large growth and must be closely trimmed as a street tree. The western plane is not an altogether handsome tree, its shedding of bark giving its trunk an ugly appearance, which is objected to by many. As a shade-producer it has no fault. The eastern plane is its superior in many respects, and it seems unfortunate that its merits were not recognized sooner. Its size and nature make it better fitted for avenues than the narrower streets. Its foliage is splendid in appearance and of proper thickness. It is free of insects. If the elms were replaced, in part at least, by this tree much would be added in way of ornament to the city. Good examples of the western planes may be found on Eleventh street, N. W., Tenth street, N. E. The eastern plane is best seen on Indiana avenue and at the Peace Monument. A magnificent specimen stands in the center of Lincoln Square, on East Capitol street.

The American linden (*tilia Americana*) numbers 5,000. Most of them are on Massachusetts avenue, which has four rows, nearly four miles in length. In early summer they are at their best, when their flowers fill the street with their fragrance. They need ample space and are apt to suffer much from the drought. They seem to have been planted too close in this city and have grown very little in late years.

The tulip tree (*liriodendron tulipifera*) numbers nearly 2,000. It can hardly be considered a good curbstone tree, as it requires good conditions for its development. It is fine in appearance and does well on wide parkings, as on Sixteenth street, which it occupies jointly with Norway maples, the latter along the curb.

The Carolina poplar (*populus monilifera*) numbers about 6,000 and was probably planted on account of its rapid growth. It is a good curbstone tree in many respects, is assertive, free of insects and is of good foliage. Its bad qualities are, brittle limbs, which are always broken by storms, and a persistency of root-growth that is fatal to sidewalks. Money considerations have doomed them and they are being replaced with more desirable trees.

The aspen poplar (*populos alba*) and ash-leaved maple (*acer negundo*), numbering about 2,000, although of good foliage, have been condemned as street trees on account of their liability to attacks of insects.

The ginkgo or maiden-hair tree, although few in number here, has been found to be a good curbstone tree. The pin oak, planted in the parking on East Pennsylvania avenue, has shown itself an ideal tree for an avenue or widely-parked street.

The catalpa, along the same avenue, will be removed in the near

future. Horse chestnut trees have been grown with some little success on Thirteenth street, N. W., but can not be called a good street tree.

The sugar maple, although a queen among trees, needs too good care for an ideal street tree. No success has been had in this city with it, although it may be said that attempts have not been persistent. A fine specimen stands in the parking, northwest of Thomas Circle.

The red oak, planted on Twelfth street, where surrounded by good conditions, has been a great success.

If required to arrange a list of the trees in this city in the order of their merit and in the light of what has been here shown, I should place the silver maple, Norway maple and eastern plane side by side in the first rank. Then the ginkgo and western plane, and last those that require extra care and are well fitted for wide parkings, the American linden, the oak and sugar maple.

The planting and care of trees in Washington grows from year to year, and the future will probably demand more skill and judgment than in years past. About $20,000 is spent annually, most of it in the care of old trees. From one to three thousand young trees are planted during the spring and fall of each year. The nursery has several thousand trees of the best varieties ready for planting. After two or three years as seedlings and four or five years in the nursery rows they are taken up with no dirt to their roots and placed on the street in holes from which four or five cart loads of the original soil have been removed. They are then filled about with suitable earth and a box placed around for protection. These boxes are seven feet in height, sixteen inches square at the bottom and ten inches at the top, built of strips 1x3 inches. They are held by four stakes driven into the ground on each side in a slanting direction and nailed to the box. Leather straps are nailed to the top of the box and passed around the tree to prevent any injury to the bark by rubbing in windy weather. These boxes are not an ornament to the street but are an absolute necessity for the protection of young trees. After the tree has gained sufficient strength, the box is removed and a wire netting six feet long is fastened around the tree. It costs about thirty-five cents per tree, and some forty thousand trees are protected in this way.

The proper distance to space trees depends on the locality and variety. Too close planting was done during the first year of the commission, the distance along curb being from twenty to twenty-five feet. From thirty to forty-five feet is now considered a better limit.

The trimming of trees is a bone of contention among authorities as to time, manner and extent. It is certain, however, that some city trees must be trimmed and trimmed severely if they are expected to last long.

This outline is presented as a study of the history of this enterprise, and some personal observations of late years. The experience of twenty-five years has not resulted in a unanimity of opinion in the commission itself, as evidenced by a report signed by the three, one of whom had this reservation, "approved as to facts but not as to opinions." I, therefore, beg to offer these facts and opinions, leaving to others the privilege of making their own selection.

# COMPILATION OF MUNICIPAL DATA IN AMERICA.

The special committee on Municipal Data, appointed on the recommendation of the president at the Nashville meeting, submitted a very full report, which was read by the chairman, Mr. Charles Carroll Brown, as follows:

*To the American Society of Municipal Improvements:*

GENTLEMEN: Your Committee on Municipal Data assumes that it was appointed in accordance with the recommendation of August Herrmann, in his annual address as president of the American Society of Municipal Improvements, at its meeting in Nashville, Tennessee, in October, 1897, contained in the following extract from that address:

> I would further recommend that a special committee, to be known as a committee on municipal data, be appointed, and that this committee be instructed to formulate a plan providing for the enactment by congress of the necessary legislation looking towards the more complete establishment and maintenance by the government of a national bureau on municipal data, with a view of having collected through it annually, and formulated for publication and distribution, a complete report with respect to municipal and public work of all kinds, showing the kind and quality of material used, the methods employed, the comparative cost thereof, the results obtained, the manner of using it, the conditions under which the work has been done, the manner of payments and guaranty, and such other information of importance relative thereto as the committee may deem advisable. The same to be submitted for the consideration of the society at its next annual meeting, and if it meets with the approval of the society, that such steps be taken at that time as may be necessary, with a view of having the same transmitted to congress with a recommendation that laws be enacted to put the same into effective operation.

Your committee has carefully considered the matter intrusted in its charge and fully concur in the opinion of Mr. Herrmann, expressed in a letter to its chairman, in which he says:

> I think it a very important department, and if ever established by the government will be very useful to all municipalities throughout the country, and I have no doubt but that, if your committee brings in a proper report, and the members of the Society would take a proper interest in the matter with their Congressmen of the localities which they represent, the matter can be successfully arranged.

Several methods of procedure are open, of varying degrees of importance, and the difficulties of setting in motion the machinery necessary to carry the projects to a successful issue, and the time necessary therefor, are in inverse ratio to their importance. All these modes of procedure are open to us at once, and we think that progress can be made in all at once, that in the more comprehensive plans being greatly aided by the work done in the less important lines.

1. The simplest portion of the project is most nearly under the control of the membership of the society.

An examination of the annual reports of municipal departments shows great lack of uniformity. Much of this is due to the great differences in methods of keeping accounts, and of beginning and carrying forward public works, on account of the differences in state laws, in city charters, and in local conditions. Your committee is of the opinion, however, that the variations in form and matter of reports can be reduced very greatly by agreement to follow, as closely as laws and fixed methods will permit, forms of report proposed by such a body as this and recommended by you and by competent governmental authority as models for the municipalities of the nation.

There are in many reports evidences of lack of co-ordination of departments; of duplication of reports, under circumstances such as to render them even contradictory of each other; of separation of work among several departments which should properly belong to one; and of consequent inability to obtain any adequate idea of the economy of operation of the departments, and to prevent duplications and omissions, which produce waste and serious difficulties. Co-ordination and co-operation of departments will be facilitated by forms such as are proposed, if the city departments are required by law or ordinance to co-operate in giving full information upon the various items of the schedules, in their annual reports.

Many reports, especially among the smaller cities, are very meager in their statements regarding the operation of the departments in their technical details, while they are very full of detail as to the exact amount paid on each individual voucher allowed during the year. The forms proposed, so far as they are applicable, will bring order out of this chaos, and enable the authorities to see the extravagance or economy of their methods of construction and operation. Many other points of a similar nature might be made.

It is doubtless true that circumstances vary so greatly in different localities that comparisons of operations in different cities are not very satisfactory, and in some cases are very misleading, but the fact remains that very valuable conclusions can be drawn from general comparisons of this sort, and much important information gathered from the study of such reports. The schedules presented herewith are intended to cover the larger items, such as can most readily be compared in reports of different municipalities, but they are also intended, as indicated therein, for models upon which to form other more detailed schedules, covering the most minute items of construction and operation. The comparison of reports made on such schedules from year to year, is perhaps the most valuable use to be made of the scheme, an intelligent study of the reports enabling the authorities to discover the places where errors of judgment have been made, and to determine what improvements may be made in methods and the results of adopted courses of procedure. The exact forms of these detailed schedules depend so closely upon the local circumstances and the personal preferences of the supervisors of the work that they are left to the judgment of these officers, without recommendation.

The general lines of reports are so nearly alike in the nature of the case, that it is believed the forms presented, when modified by the combined wisdom of the society, can be closely followed to great advantage, individually and collectively, by practically all cities.

The committee presents forms of water-works reports prepared by the chairman, of sewerage reports prepared by Mr. Beach, and of street reports prepared by Mr. Thompson, each having had special opportunities of study in the line assigned to him. It suggests that forms for other lines of municipal work be prepared by experts in those lines, to be added to these forms if they are deemed worthy of adoption by the society, and recommends the formulation of such schedules for gas and electric lighting, garbage collection and disposal of street cleaning, sidewalk construction and the

addition of such others from time to time as are demanded by the extension of municipal activities.

2. One of the duties of the next session of congress will be the establishment of a bureau for the census of the year 1900. A beginning was made in the last census in the collection of municipal data, but those of us who have tried to extract anything from the data offered, have found the reports of little value for most purposes. This is due, largely, of course, to the incompleteness and lack of uniformity in the information furnished by the municipalities, but is due almost as largely to the form of report adopted and the lack of system in many of the classes of items on which information was requested.

It is therefore recommended that, when the schedules are amended, enlarged and adopted by the society, a resolution be adopted recommending the adoption of the schedules by the census bureau as the forms for reports requested by that office from the municipalities of the nation, and that a committee be appointed to present this resolution to the proper authorities at the proper time, to press it upon their attention, and to secure adoption if possible.

3. The establishment of a new bureau in any department of the government is a serious matter, requiring much thought and great labor. To what department the bureau of municipal data, proposed by Mr. Herrmann, should be assigned is the first question for consideration.

It is the opinion of this committee that a permanent census bureau is a desideratum. The collection of municipal statistics pertains properly to such a bureau. Your committee therefore recommends the passage of resolutions recommending the establishment of a permanent census bureau, with powers and facilities for collection of various kinds of statistics at any and all times as required by congress, and for the inclusion of a bureau of municipal statistics in the permanent provision for departments in such permanent census bureau; the appointment of a committee to present this resolution to congress in such manner as they may deem most effective; and an appeal to the municipalities represented in this society and at large, for aid in presenting the matter effectively to congressmen and others of influence in shaping such legislation, such appeal to be presented in such manner and at such times as the members of the committee and the executive board of the Society shall deem expedient.

The schedules for reports mentioned in this report follow as an appendix hereto.

Respectfully submitted,

CHARLES CARROLL BROWN, Ch.,
LANSING H. BEACH,
ALMON D. THOMPSON,
*Com. on Municipal Data, A. S. M. I.*

PROPOSED FORMS OF WATER-WORKS REPORTS.

The following schedules, proposed as forms of water-works reports, have all been taken from forms of municipal water-works reports in actual use. No one report contains all of them, but every item in every schedule is used in some such report. It is not probable that any one report would require all the schedules proposed. The attempt has been made to give forms for all the general schedules that might be required by any system of management in use. Many additional forms for reporting details are used by various water-works authorities, but no attempt has been made to cover this part of the field, the diversities in methods of keeping accounts being too great, and the importance of such reports being too slight, to make this desirable. Some may consider that too many schedules have been given, but it is probable that all would not agree on the omission of any one schedule. They are presented with the hope that cutting down will be deemed necessary rather than additions.

*Water-works of the city of* ———, ——— County, ———State. Year ending ———.

Population by census of 1890. Of 18—. Estimated at date.

Ownership of works.

Dates of construction. Items.

Sources of supply, whether lake, river or stream, springs, wells, deep or surface.

Mode of supply, whether gravity from storage or distributing reservoir, pumping to storage or distributing reservoir, direct pressure, with or without standpipes.

Reservoirs. Size and capacity of each, with elevation above point stated.

Stand-pipes, size and capacity.

Settling basins, size and capacity.

Filters, kind, size and capacity.

Wells, number, kind, size, depth, level of water, pumps working and not working, greatest and least supply.

Pumping plants, size and capacity of each engine, totals for each station and for entire city. Boilers, number, size and rated capacity.

Pressure at pumps, maximum and minimum pressure in pipe or distribution system. Additional for fires.

Suction lift in feet.

Total miles of pipe.

Total number of service connections.

Total number of hydrants.

Total number of meters.

Total number of public fountains and watering troughs.

*Tabular Statement of Entire Issue and Redemption of Bonds.*

Heads of columns are as follows:

Number of issue.

Authority for issue.

Date of issue.

Date when payable.

Amount.

Rate of interest.

Amount redeemed.

Date of redemption.

Amount outstanding.

Right-hand column contains the numbers of the consecutive issues of bonds, with line at foot for totals.

*Total Cost and Present Valuation of Works.*

(This table contains all items that can properly be charged to construction, and does not contain any that belong properly to maintenance and repairs.)

Heads of columns are as follows:

Real estate, including lands and buildings, giving as many sub-items as may be desired.

Reservoirs and stand-pipes, with sub-heads for each and for total of all.

Pumping system, with sub-heads for each and for total of all.

Supply mains.

Distribution system.

Service connections.

Meters.

Engineering.

Administration, including office and field outfits necessary.

Total cost of works.

The right-hand column contains in order:

The consecutive numbers of years since construction began.

The total costs of constructions.

The total amount deducted from cost at date of last report for constructions abandoned, replaced or otherwise disposed of.

The amounts so deducted during the year.

The totals of the two preceding lines.

The present valuations, being the differences between the total costs and the total deductions.

*Annual Receipts.*

Sales of water, regular rates.
- special rates.
- meter rates.
- meter rents.
- fire hydrants.
- street sprinkling.
- delinquent rates.
- other city purposes.
- miscellaneous.

Connections, including materials.

Permits and licenses.

Other special items as desired.

Total receipts from operation of works.

Bonds.

Interest.

Direct taxes (frontage, etc.).

City tax levy or appropriations from general funds.

Real estate, sales or rentals.

Sales of other property.

Grand total receipts for the year.

*Annual Disbursements.*

(Details of each of the following items should be given in separate statements with the minuteness desired.)

General items. Refunds.
- Interest.
- Bonds retired.
- Sinking fund.
- Paid to city funds.
- Stock on hand and cash balance on hand to balance statement of receipts.
- Total of general items.

Construction, Supply system.
- Reservoirs and stand-pipes,
- Intakes and wells.
- Filters.
- Meters.
- Pumping-works, buildings and ground.
- Pumping-works, engines and boilers
- Shops and other buildings.
- Supply mains.
- Engineering.
- Total of supply system.

Distribution system.
- Street mains.
- Tapping or plumbing department.
- Total of distribution system.

Total of all construction.

Maintenance and repairs.
Reservoirs and stand-pipe.
Intakes and wells.
Filters.
Buildings and grounds.
Engines and boilers.
Shops and other buildings.
Supply mains.
Street mains.
Other items, as desired.
Total maintenance and repairs.
Operation. Pumping expense.
Salaries and labor.
Fuel, including delivery.
Supplies (Oil, waste, etc.).
Total pumping expense,
Service connections.
Meter service.
Hydrant service.
Transportation of men and materials.
Office salaries and labor. Administration.
Total cost of operation.
Total disbursements.

*Comparative Statement of Operation.*

Heads of columns are as follows:
Year.
Receipts from operation of works.
Total operation expenses.
Total maintenance and repairs.
Net earnings above total operating, maintenance and repairs.
Interest on bonds paid, stating whether from water-works receipts or from city funds.
Sinking fund payments made, giving similar statement.
Total gallons of water pumped.
Revenue per million gallons.
Total cost of operation, maintenance and repairs per million gallons.
Right-hand column gives consecutive numbers of years since works began operation.

*Comparative Meter Statement.*

Heads of columns are as follows:
Year.
Number of water takers.
Number of meters.
Total amount of water consumed.
Amount estimated as used for public purposes, not metered.
Total amount of water metered.
Total receipts for water.
Total receipts for metered water.
Right-hand column gives numbers of consecutive years since works began operation.

*Water Pipes in Use.*

Heads of columns are as follows:
Size and kind of pipe.
Length in use at beginning of year.
Length added during the year.
Length discontinued during the year.
Length in use at end of year.
Total cost.
Per cent. each size is of the total length of pipe in use.
Per cent. each size is of the total cost of pipe in use.
Number of service connections.
Length of service connections. (Each size if desired.)
Number of hydrants.
Number of valves.
Right-hand column has line for each size and kind of pipe and for total.

*Cost of Pipe Laying.*

Each line laid may be described as follows:
Location of line.
— ft. of — in. pipe, weight, — lbs., cost, $——.
Pipe inspection cost.
Valves, No., —, size, —, cost, $——.
Fire hydrants, No., —, description, —, cost, $——.
— ft., — in., hydrant pipe, cost, $——.
Special castings, description, —, No., —, lbs., —, cost, $——.
— lbs. lead, cost, $——.
Coal, packing and incidentals, cost.
Labor cost.
Total cost of pipe laid.
Cost of paving.
Total cost complete.
Average cost of labor per foot.
Average cost of pipe laid per foot.
Average cost of pipe laid and paving complete, per foot.

*Tables of Pumping Records for the Year.*

(One for each pump or each group of pumps acting together.)
Heads of columns are as follows:
Month.
Days pump was run.
Hours pump was run.
Number of revolutions.
Average number of revolutions a minute.
Pump cylinder dimensions.
Length of stroke.
Number of gallons pumped.
Total for all engines in group.
Average per twenty-four hours.
Pounds of coal consumed, including all used for pumping, banking, heating, etc.
Steam cylinder dimensions.
Average steam pressure——, maximum——, minimum——.
Average water pressure at pump——, maximum——, minimum——.
Average suction lift——, maximum——, minimum——.
Total lift of water, including friction.
Pounds of ashes removed.
Duty per 100 pounds of coal.
Right-hand column contains a line for each month in the year, total for the year and averages.

*Cost of Pumping.*

(Table for each station.)
Population served, if possible.
Builder and kind of each pumping engine, and cost.

Number and kind of boilers, size and cost.
Cost of station buildings and other appurtenances. (Divide into independent groups if more than one group in station, for the following items:)
Daily capacity of each engine.
Hours each pump was run during the year.
Days each pump was run during the year.
No. gallons pumped a day. Average, —; max., —; min., —.
Total gallons pumped in a year.
Average feet lift, including friction. (Delivery pressure and suction.)
Average feet lift, static.
Pounds of coal used during the year, including wood, reduced to coal and with no deductions for heating or other purposes about station.
Kind of coal used, size and brand.
Cost per 2,000 pounds delivered at station. (If different kinds of coal are used, separate into items for each kind, or, if this is impossible, give average cost per ton of all coal used,
Pounds of ashes removed.
Gallons pumped to stated average lift with 100 pounds of coal.
Gallons pumped 100 feet high with 100 pounds of coal.
Duty of engine per 100 pounds of coal.
Quarts of engine oil used.
Quarts of cylinder oil used.
Total cost of fuel during the year.
Total cost of labor in pumping for the year.
Total cost of oil, waste and supplies for the year.
Total cost of ordinary repairs in pumping for the year.
Total cost of pumping for the year.
Average cost of each above item for 1,000,000 gallons to given average lift.
Average cost of each above item for 1,000,000 gallons to lift of 100 feet.

*Monthly Consumption of Water.*

Heads of columns are as follows:
Month.
Number of gallons pumped.
Metered.
Not metered and waste.
Average daily consumption.
Average per capita on estimated population.
Number of takers, or taps.
Number of meters.
Estimated number of consumers.
Maximum day's consumption or pumping.
Minimum day's consumption or pumping.
Right-hand column gives names of months and total.

*Comparative Statement of Consumption.*

Heads of columns are as follows:
Year.
Population, census or estimated.
Estimated number of consumers.
Total gallons pumped per year.
Average gallons pumped per day.
Average gallons per inhabitant per day.
Average gallons per consumer per day.

THE CINCINNATI BALANCE SHEET.

Cincinnati keeps a balance sheet in about the following form, which may be of interest to some:

*Balance Sheet for year 18—.*

Heads of columns are as follows:
1. Names of ledger accounts.
2. Totals of each ledger account, paid out.
3. received, or on hand.
4. Operation paid for maintenance and expenses.
5. received for rents, sales, etc.
6. Construction. Paid.
7. Footing of previous column entered in this, to balance, represents total cost of construction.
8. Valuation of water-works. Footing of the following column, entered in this to balance, represents total value of works (net capital).
9. Value at beginning of year, and additions during year, entered in this column.
10. Balance, assets.
11. liabilities.

(Columns 2 and 3 have the same total. The balance of columns 4 and 5 goes to column 8 or 9, usually 9. The balance of columns 6 and 7 goes to column 10. The balance of columns 8 and 9 goes to column 11. Columns 10 and 11 have the same totals.)

The items in the right-hand column may be carried to any desired degree of detail. The following are suggested after a study of those given in the Cincinnati report. Each item appears in columns 2 or 3 or both and in others as stated below.

Names of ledger accounts.
Total valuation of water-works to column 9.
Water-works bonds to 11.
Sinking fund to 10.
City treasurer to 10 or 11.
Interest account to 4.
Cash account to 10.
Water rents to 5.
Office expense to 4.
Office fixtures to 6.
Pumping stations maintenance to 4.
construction to 6.
(Items for each station.)
Reservoirs, stand-pipes, tanks, items for each one for maintenance and construction to 4 and 6 respectively.
Street mains, extensions to 6.
repairs to 4.
Supply mains, extensions to 6.
repairs to 4.
Hydrant service to 4.
Tapping service to 5.
Engineering department to 4.

Repair department to 4.
Administration to 4.

*Other Suggestions.*

Erie, Pa., carries a statement of the standing of the account of the water-works with the city, which shows whether the works are self-sustaining or not, and to what extent they are paying for themselves, when all allowances are made. The items of the account are as follows:

Due from water-works to city at last report.
Received from bonds issued during the year.
Received from taxes or appropriations during the year.
Interest on first item above at rates of interest of outstanding bonds, remainder at 4% for one year.
Interest on new bonds issued from date of issue to end of year.
Office rent if in city building.
Total.
Cash to city funds. (Designate.)
Water furnished city. (Items and amounts to be charged therefor.)
Total.
Balance due from water-works to city at date of this report.

Following are headings of other tables that may be desired by some from time to time:

Hydrant locations.
Valve locations.
Pipe distribution.
Comparative statement of yearly pipe laying.
Meter distribution.
Service pipes added, discontinued and totals.
Permits issued.
Buildings examined.
Rainfall records.
Fire alarms.
Rate sheet.
Present valuation of works.

PROPOSED FORMS OF STREET CONSTRUCTION REPORTS.

*Pavements. General Statistics.*

City of ——, State of ——.

Heads of columns are as follows:
(Items of information.)
Asphalt, Sheet.
Block.
Brick.
Wood, Cedar Block.
Pine Block.
Granite.
Sandstone.
Limestone.
Cobblestone.
Miscellaneous pavements.

The right hand column of items of information contains the following lines:

Total square yards in city.
" miles in city.
Square yards laid in 18—.
Miles laid in 18—.
Year first laid.
Maximum grade for pavement.
Guaranteed period, years.
Maximum cost per square yard in 1898.
Minimum " " " "
Average " " " "

Foot notes:

Explain fully the items included in the price per square yard as given in each case.

Explain fully the conditions of traffic to which each class of pavement has been subjected, such as heavy, medium, light, and the satisfaction each has given in wear, with reasons.

Give extremes of temperature during year.

CONSTRUCTION DATA.

*I. Sheet Asphalt.*

1. Kinds of asphalt laid.
a. Number of square yards of each kind of asphalt now laid.
b. Number of miles of each kind of asphalt now laid.
c. Name kinds of asphalt admitted by the specifications now in force.
1. Foundation.
a. Character — sand, gravel, concrete, etc. If concrete, give proportions of various ingredients.
b. Thickness, inches.
3. Asphalt surface.
a. Total thickness, inches.
b. Is cushion or binder coat used?
c. Thickness of same, inches.
d. Thickness of wearing surface, inches.

*II. Block Asphalt.*

1. Size of block.
2. Foundation.
1. Character — gravel, macadam, concrete, etc. If concrete, give proportions of various ingredients.
b. Thickness, inches.
3. Cushion.
a. Material.
b. Thickness, inches.
c. Material used for filler.

*III. Brick.*

1. Size principally used.
2. Single or double course used.
3. Foundation.
a. Character—gravel, macadam, etc. If concrete, give proportions of various ingredients.
b. Thickness, inches.
4. Cushion.
a. Material.
b. Thickness, inches.
5. Filler.
a. Material.
b. Merits and faults of each kind used.

*IV. Wood.*

1. Blocks.
a. Kinds.
b. Side.
2. Foundation.

a. Character—macadam, plank, gravel, etc. If concrete, give proportions of various ingredients.
b. Thickness, inches.
3. Cushion.
a. Material.
b. Thickness, inches.
4. Filler.
a. Material.

*V. Granite.*

1. Blocks.
a. Kind of granite.
b. Size of blocks.
2. Foundation.
a. Character—macadam, gravel, etc. If concrete, give proportions of the various ingredients.
b. Thickness.
3. Cushion.
a. Material.
b. Thickness, inches.
4. Filler.
a. Material.

*VI. Miscellaneous Pavements.*

1. Description.
2. Foundation.
a. Material. If concrete, give proportions of various ingredients.
b. Thickness, inches.
3. Details of cushion and filler, if used, and other points of construction.

*Prices for Material and Labor.*

1. Give market prices of the following construction materials delivered on the work, or of such of them as are used in paving work.
a. Broken stone for concrete, per cubic yard.
b. Broken stone for macadam, per cubic yard.
c. Sand, per cubic yard.
d. Gravel, per cubic yard.
e. Cement, per barrel, natural.
f. Cement, per barrel, Portland, imported.
American.
g. Filler, other than sand, per square yard of pavement.
h. Curbing, per lineal foot, material.
setting.
i. Excavation and removal of material to make place for pavement, per cubic yard.
average per lineal foot of street.

2. Give prices paid for the following kinds of labor:
a. Common labor, per day.
b. Foremen, per day.
c. Man and team, per day.
d. Concrete mixers, per day.
e. Pavers, per day.
f. Length of working day, hours.

*Financial Statistics.*

1. Total amount expended for pavements in 18—.
2. Total amount of outstanding indebtedness for pavements.
City debt.
Property owners' debt.
3. Proportion of cost paid by city.
Property owners.
4. Explain briefly the method of assessment, by frontage or area of contiguous property, etc. Does non-contiguous property pay portion of cost? If so, what per cent.?
5. Explain briefly method of paying assessment, cash yearly installments, etc.
6. Bonds issued to anticipate installments.
Length of time they run.
Amounts in which issued.
Interest, per cent. per annum.
Are bonds a general city charge, or are they a lien on the property assessed?

*Detail Table of Streets Constructed. One for Each Kind of Pavement.*

Heads of columns as follows:
Location.
Authority for construction.
Contract and contractor.
Length.
Width.
Area, square yards, including wings and intersections.
Length of curb.
Other items of materials and labor.
Cost. Excavation.
Foundation.
Wearing surface.
Curb.
Other items.
Total.
Cost per square yard. Total.
Excluding excavation.
Excluding excavation and curb.

## APPARATUS FOR TESTING CEMENT AND PAVING BRICK.

In connection with the railway laboratory which has been made a great feature of Purdue University complete equipment has been provided for the testing of cement and paving brick, embracing mixing tables, tanks, a drying oven, apparatus for absorption tests of atmospheric pressure or *in vacuo*, and other newer apparatus. Down one side of the laboratory is a line of testing machines, ranging from a 600-

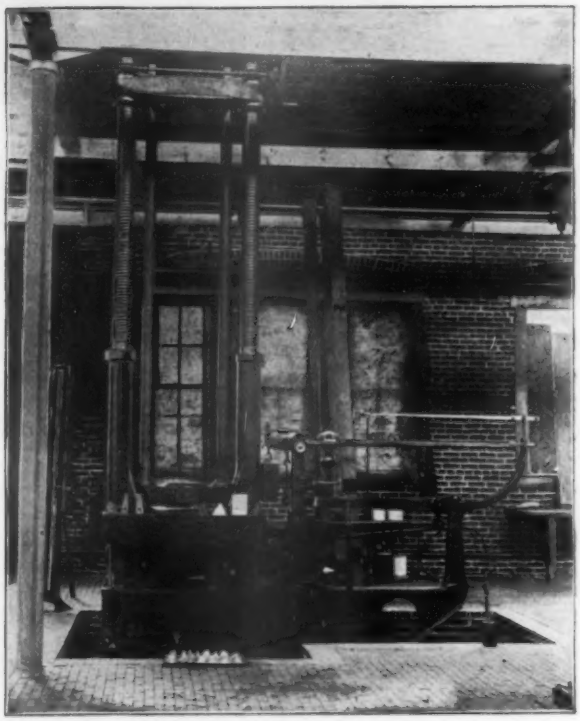

FIG. 1.—300,000 LB. TESTING MACHINE.

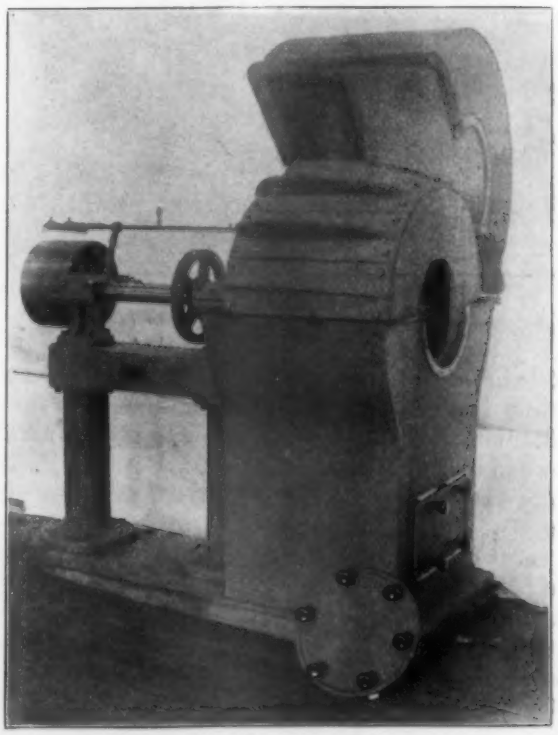

FIG. 2.—TUMBLER FOR PAVING BRICK OPEN.

pound Riehl wire tester to a 300,000-pound Riehl vertical testing machine, a view of which is shown in Fig. 1. It was on this machine that the record tests on limestone and granite were made last year for the state geologist of Wisconsin. This machine, along with two Olsen machines of 30,000 pounds and 100,000 pounds capacity, respectively, will provide for crushing and cross-breaking tests.

The equipment embraces an improved form of tumbler for the rattler test of paving brick, as shown in Figs. 2 and 3. It is of the dimensions recommended by the National Brick Manufacturers' Association, and differs from the ordinary tumbler or rattler in the fact that provision is made for the insertion of brick in the end of the barrel, thereby obviating the necessity of removing a slat. The view in Fig. 2 shows the dust-cover raised, exposing the polygonal barrel. The dimensions of the rattler are: 20 in. long by 28 in. in diameter. There are 14 slats.

The drawing of a slat is shown in Fig. 4. The length of bearing is 8 in. The diameter of the shaft is 2 7-16 in. The dust falls into a pan below, and can readily be removed. An ordinary cyclometer, such as are used on bicycles, serves to record the revolutions. A second view, given in Fig. 3, shows the gear. This improvement on the old form of tumbler originated in the laboratory, while the excellence of the details and the handsome appearance of the machine are due to the skill of W. P. Turner, instructor in the machine-room, who made the working drawings.

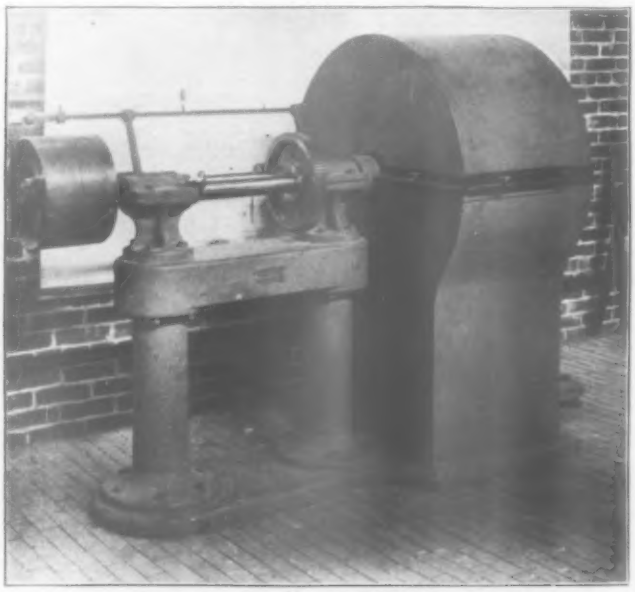

FIG. 3.—PAVING BRICK TUMBLER CLOSED.

The work in hand for this machine includes an investigation of the effect of temperature on the results of the rattler test; the difference in the results with mixed and unmixed charges. The work of the testing laboratory is supplemented by a well-equipped chem-

ical laboratory with a corps of trained analysts.

The university has wisely decided to put under one management the work in applied mechanics, and the work in tests of materials, and thus gain the benefit of the mutually helpful interaction of classroom and laboratory work. Prof. W. Kendrick Hatt, A. M., C. E., associate professor of applied mechanics, is in charge of both departments. Professor Hatt is a member of the Engineers' Club of St. Louis, of the Indiana Academy of Science, of the International Society for Testing Materials, and various other scientific societies. He is chairman of the committee appointed by the American section of the International Society to report on the present state of impact tests, this appointment coming as a well-deserved recognition of the work done by him in that field. Prof. Hatt has designed a new impact machine for longitudinal impact on iron and steel specimens.

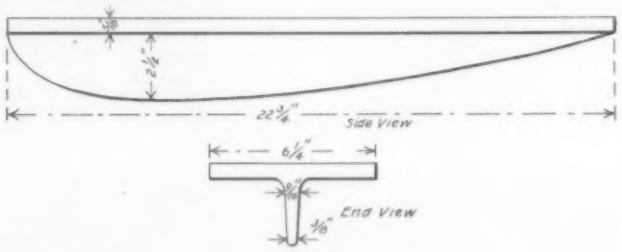

FIG. 4.

## HEAVY LOADS ON PAVEMENTS.

*By George L. Wilson, Assistant City Engineer, St. Paul, Minn.*

In the construction of the new state capitol now in process of erection at St. Paul, the marble used for the exterior walls is quarried in Georgia and brought in large blocks to the site of the building. This is about one and one-half miles from the railroad side-track where the blocks are unloaded from railway cars to a truck having wheels three feet six inches in diameter and six-inch tires, built especially for this work.

The blocks are of different sizes, but all large enough to give very heavy wheel loads on the pavements over which they are drawn. Blocks of eleven to fourteen tons are common and there have been quite a number weighing sixteen to twenty tons. During the past season some 4,800 tons have been delivered and there remains considerably more than this amount yet to be received. The record shows that wheel loads of from three to five tons are common, an amount which is certainly sufficient to thoroughly test the pavement over which such loads pass. About two-thirds of the distance from cars to the building site is over asphalt pavement, the remainder stone and wooden block. During the early summer this traffic passed over one street, where on account of street railway tracks and a heavy vehicle traffic, amounting to seventy-nine tons per foot of roadway,

the trucks continually passed in one line on the street. The asphalt surface being rather soft, this continued passing in one line began to squeeze the asphalt towards the gutter. The hauling of the marble was then diverted to a parallel street of less traffic, on which the trucks were not confined to the same line of travel. On this, and on two other streets, passed over for the entire time, the hauling of fifteen to twenty-ton loads has produced no perceptible effect. When a load of five tons per wheel was allowed to stand for four or five minutes to rest the teams, a depression of one-sixteenth to one-eighth inch could be seen where the wheels stood. These depressions soon smoothed out under the usual traffic of the street and at the present time the hauling is still in progress and there is no indication of damage to the street surface. Two of the streets passed over were laid in 1895 with Trinidad sheet asphalt by the Warren-Scharf Asphalt Paving Company and one with Bermudez. A block of one street was laid in 1897 and also a part of one street in 1898. The length of time the pavement was down did not seem to influence the results.

On one of the streets with sandstone paving the corners of the blocks have crushed off and show marks of heavy wear to which they have been exposed. Some granite paving not on a concrete foundation has been considerably rutted and parts of it will need to be relaid. The wooden block pavement has suffered somewhat, but less than was expected, owing to the traffic on this portion of the route being distributed over several streets. The accompanying view shows one of the loads standing on the street and gives a further idea of the size of the blocks.

TWENTY TONS ON AN ASPHALT PAVEMENT ON E. FOURTH STREET, ST. PAUL, MINN.

## USE OF ACETYLENE GAS FOR STREET LIGHTING.

Acetylene gas is to be used in Wabash, Ind., for street lighting. In reply to a letter of inquiry regarding the project, Mr. Robert P. Woods, city engineer of Wabash, writes MUNICIPAL ENGINEERING as follows: "Acetylene gas is to be installed in the artificial illuminating gas plant of the Logansport & Wabash Valley Gas Co. at Wabash, Ind., within a few weeks—probably before November 1. The generator is expected here about October 10, and work will proceed rapidly on the necessary changes. It is intended to supply both street lighting and domestic use. The old artificial mains will be used for the new gas. No information is known here concerning the generators as yet. It is a strange coincidence that Wabash should be the city selected for this experiment—the first instance where acetylene gas has ever been attempted for supplying a city—as it was the first city to install an electric light plant for street lighting. The Brush Electric Light Co., of Cleveland, O., constructed the tower plant here in 1881."

## AGGREGATES IN CONCRETE—SAND.

*By Warner H. Jenkins, C. E.*

Making concrete with cement will not give satisfactory results unless there is an affinity with the mortar agent, sand. This important aggregate should be of a silicious nature, without the admixture of carbonates. Silica, in its pure state, has great affinity for cement and produces great adhesive energy, while carbonates give very unsatisfactory results.

In proportioning the compound, we should first ascertain, by authentical calculations, the quantity of sand that can be used, without detriment to strength. We have a peculiar function to perform, not merely to add to the quantity, but to suppose that we have a given measure of space to fill. We know that our sand is much coarser in texture than our cement; and knowing this we proceed to make the cement fit the sand. We accept the voids or interstices of the sand as the measure for gauging the quantity of cement. This can readily be ascertained by first drying the sand and then filling a given measure with it. We can then apply water until we have flooded the quantity contained in the space. The quantity of water used will be equal to the voids in the sand. We have now ascertained exactly the quantity of cement that will exactly fit the voids contained in the sand, but we still require an additional amount of cement over and above the filling of the voids. We wish to completely coat each particle or grain of sand with this mortar. The writer has found from experience that the quantity of cement employed with sand to produce mortar which will give satisfactory results should equal the voids plus 3 per cent. for slushing. By these proportions the voids are filled and the entire mass is completely enclosed. Sand used with

cement in greater proportions only tend to weaken the compound. When properly proportioned, the cement mortar, when prepared, should not occupy a space perceptibly greater than the quantity of the sand alone.

## LETTERS FOR THE PUBLIC.

### MORE ABOUT CREOSOTED WOOD BLOCK PAVEMENTS.

*To the Editor of Municipal Engineering:*

Were it not for the fact that your magazine is read by a large number of people who are not engineers and have given the subject no study, but who give credence to matters they may read therein because of the fact that it is an engineering magazine, I should not waste the time to say a word about the last communication of Mr. Hetherington about creosoted wood blocks.

I labor under some difficulty in making reply to his articles as his errors in logic and statement of facts are so numerous that to answer each misstatement in detail would take up more of your space than you could give or I would care to occupy. I take it that much of this is caused from the fact that he has had no experience or training with wood pavements, and have no doubt that it would disappear if he were writing about asphalt, an industry with which he is more closely allied. The fact that a man is interested financially in an industry should not debar him from writing about it. If he is engaged in it it is a subject that he should know about, and if he is fair and truthful he is often the best writer on the subject, but, if he is interested in asphalt, this does not qualify him necessarily to write on the subject of block paving, and the public to whom his testimony goes is entitled to know his bias. Mr. Hetherington in his articles is neither fair nor accurate. To prove this one has but to read carefully his reply to my article in your September number.

He made a point that creosoting does not increase the resistance of the wood abrasion. I quoted eminent authorities to the effect that creosoting increases the *bending strength*, *compression strength* and *hardness* of lumber. He replies that he was not talking about bending strength; in other words, he quibbled.

Again he quibbled that he did not say, "*dry sand* would pack itself into an unyielding body." He did say that the various experiments to find a remedy to prevent blocks rising from expansion were "without avail;" the practice is to use *dry* sand, and it is a complete success.

He published a picture of a block street in which he claimed the blocks were raised by expansion and labeled it, "creosoted pine blocks." I called his attention to the error about the kind of wood, which he did not acknowledge, and to the fact that no provision had been attempted to take care of expansion. He made no reply to these statements, but promised that he would go to Europe some day and see about pavements. It is to be hoped that no large number of your readers will feel that all paving matters must stop until he has gone over and reported.

But, if Mr. Hetherington quibbled in the September number, he outdid himself in his last article, in your October number. He quotes Mr. J. W. Byrnes, of Galveston, Texas, as to the method of laying creosoted blocks in that city which have lasted over twenty years and are good yet. The pavements there, as Mr. Byrnes states, are built as follows: The blocks are five inches thick, five to six inches deep and from six to ten inches long, creosoted, laid on a bed of sand that has been compacted by flooding with water, the joints filled with clean, dry sand and the surface rammed until the interstices are filled, and then flooded twice with paving pitch, thus making the pavement impervious to water.

Now, there is nothing extraordinary about the statement. It had been published once before in your magazine, but Mr Hetherington quibbles with it in this wise: "There can be no fair comparison made between the block pavements of Galveston" (some of which have been down twenty-five years and are in good condition yet) "and those of Indianapolis;" but look at his reasons: "First, because the blocks are of different dimensions from those used in Indianapolis. The foundation is entirely different and the interstices" (note the word) "between the blocks are not carefully rammed with a mixture of sand and tar." This is a misrepresentation of what Mr. Byrnes said, which was that dry sand was put in the interstices and the *surface* rammed. No mixture of sand and tar is rammed in the interstice, either here or at Galveston. It is merely another case of quibbling.

A concrete foundation is used in Indianapolis, a sand foundation in Galveston. Certainly no one with any knowledge of engineering or construction will contend that a sand foundation is equal to a concrete foundation. Mr. Hetherington's comment is, that "it is probable that the sand foundation here spoken of serves to conduct away the moisture." He does not stop to inquire or explain how moisture is to get through six inches of creosoted yellow pine with the interstices made impervious by being filled with sand and tar, but one quibble more or less does not amount to much.

As to the size of the blocks: The size used in Indianapolis is standard, and except they are not quite so wide or deep, as in Galveston, they are the same. The timber is the same, being cut from the same forests by the same firms as the pavements laid in Galveston, creosoted by the same process, laid in the same way, except on a concrete base, and yet Mr. Hetherington quibbles. Nothing is gained by such sophistry and misrepresentation. The question is asked, can good, durable pavements be made of wood; if so, they are very comfortable and desirable. The science of construction is so near standard, that no well-equipped engineer would be led away by such sophistries as that about the size of the blocks. Experience is often necessary to tell about materials, but if good, durable wood pavements have been laid in Galveston, London, Liverpool and dozens of other cities, by using hard, well-selected wood and creosoting the same, why, we know that the same can be done in Indianapolis, in Cleveland, St. Louis or any other city where the same kind of materials can be obtained. *C. A. Kenyon.*

## MERITS OF THE COMBINED AND SEPARATE SYSTEMS OF SEWERAGE.

*To the Editor Municipal Engineering:*

In your October issue there is an article on "A Comparison of the Combined and Separate Systems of Sewerage," by C. P. Collins, C. E. The heading of his article is hardly correct, as the comparison is incomplete and the conclusion drawn therefore unfair. It might more properly be called the defects of a poorly constructed combined system. Both systems have their points of excellence, and he is correct when he says, "Engineers themselves differ widely as to the best plan to pursue." The combined system which he condemns, if properly designed and constructed as in modern practice, is almost wholly free from the defects he points out. As to which system should be adopted in the removal of sewage from any town or city, local conditions should and must decide which is best for that particular case. Many problems enter into such a work as, *e. g.*, is the sewage to be treated in its final disposal, what are the topographical conditions of the place, the amount of territory to be drained and the density of the population upon this territory. Neither system can be said to be best for all cases. That one should be chosen which seems best to meet all the problems under consideration. One can be made as sanitary as the other so far as that question is concerned. The storm water in our cities carries with it pollutions as foul and dangerous as any sewage, from which it is never free. The combined system of the past was not designed to meet the sanitary requirements of to-day, and it is not to be wondered at that it is so severely criticised.

*A. B. Raymond, C. E.,*
*Sanitary Engineer of Detroit.*

# THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

## THE BEST METHOD FOR MAKING CEMENT WALKS.

Lewis Wetmore, of Seneca, Kansas, describes his method of laying cement walks and steps, where the surface soil is "gumbo," and asks whether improvements can be suggested:

1. Foundation for steps, 18 inches, and for walk, 9 inches deep.
2. A layer of sand 4 inches deep under walk.
3. A layer of concrete, of broken stone, sand and natural cement, 4 inches thick, for walk.
4. A top layer 1.5 inches thick, composed of one part of Portland cement and one part of fine, sharp sand.

He asks if any Portland cement should be used in the base, if the top can be thinner, and if it should be finished by floating and troweling, or with a skim of clear cement.

1. The depth of the foundation depends upon the character of the soil and the ease of drainage. In an impervious soil, where there is no chance for water to get under the walk or steps, 8 or 9 inches is sufficient, but in view of the uncertainty of such conditions, sufficient depth of porous materials should be allowed to insure that any water under the walk will be drained away quickly enough to prevent heaving of the walk by freezing. Some specifications require 12 inches of such material as cinders, or broken stone, gravel and sand, so that the portions next the walk, at least, shall be entirely free from water at all times. This layer

should be well compacted, so that there will be no settlement or displacement of material in it. A depth of 8 or 9 inches is sufficient in most cases.

2. The layer should be coarse sand or sand and gravel, with broken stone added if desired.

3. The thickness of the layer of concrete need not be greater than 3 inches. A good specification requires a box 4 inches deep to be filled even full of a mixture of one part Portland cement, same as used for top, two parts of clean sharp sand, these two being mixed thoroughly while dry, made into mortar with the least possible amount of water, and then thoroughly mixed with broken stone one inch or less in diameter, or with gravel in proportions sufficient to fill the voids in the gravel with mortar. The proportion of Portland cement is about one part to five of sand and gravel. Some contractors use natural cement in the base and seldom have complained of trouble. More cement must then be used. It is safer, if the work is guaranteed, to use Portland cement of the same brand as used in the top. When this layer is thoroughly rammed, it will be about 3 inches thick—possibly a little less.

The top layer should be put on before the concrete has set, so that a complete junction between the two will be insured. Possibly some of the trouble from using natural cement in the base comes from the fact that it sets quicker, and so a delay in putting on the top prevents this close union and results in the top separating after a few weeks. A full inch in thickness of top is sufficient unless the wear is to be very excessive. One part of cement to one of clean, sharp sand, mixed with the smallest amount of water possible is a common specification. One part of cement to 1.5 parts of sand is quite as good a mixture for almost every situation. The surface should be well troweled to a smooth surface at exactly the proper time after the layer has been thoroughly compacted and the first set has begun to show. A skim of neat cement makes a neater looking job at the beginning if it is allowed to set thoroughly before use, but it is difficult to make the surface such that it will not afterwards peel or wear off, leaving the top uneven in color and possibly in surface.

A Portland cement of known uniformity and quality and fairly slow setting should be used. Some Belgian and some other foreign cements are not true Portland cements, and have not strict uniformity in quality which is an indispensable requirement in Portland cement for walks.

Blocks should not be too large—not more than about 30 square feet in area. Many cracks in walks occur from lack of opportunity for expansion because blocks are too large or are not completely separated from each other.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.

## REPAIRS TO MACADAM ROADS.

**Should repairs to a macadam road be made by putting loose crushed stone directly on the old surface? Should loam or clay be mixed with the cracked stone on the road? Our road is always out of order.**
*W. W. S., Bloomfield Ave., Newark, N. J.*

The road should be cleared of mud and dust and the old surface roughened a little before adding new material for small ruts as well as general repairs and resurfacing. Screenings from the crusher can be added, but no clay or loam in repairs. The rollers used are usually

far too light, and hence the temptation to use loam and clay to bind the stone in place long enough to get the job done and get away, with a certainty of the need of much work within another year and a fresh job of equally poor repairs. Your case is one of many all over the country. Such repairs are neither efficient nor in the end economical. Full rules for maintaining macadam have been given in previous numbers of MUNICIPAL ENGINEERING.

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### USES FOR OLD STONE BLOCK PAVEMENTS.

**In New Orleans we have some very old pavements which are about to be replaced by more modern ones of brick and asphalt. Can you suggest other uses for our old granite blocks, about 14 inches square and 6 inches thick, than as foundations for asphalt pavements for which they are too irregular and to elevated?**

*Contractor, New Orleans, La.*

If the old granite pavements, as they stand, can not be used for foundations for asphalt pavements, it would be well to consider if the blocks could not be relaid at a lower grade, as at New York and elsewhere, by taking them up, grading away some of the earth and resetting the blocks. Then by the use of asphalt binder (bituminous concrete) and the asphalt pavement surface you could finish with excellent results. Another plan would be to crush the blocks on or near the street and use them for making concrete foundations for brick, asphalt or other pavement. Many could be split into blocks 6 x 7 x 14 inches, a fair size for paving unimportant streets, the new faces of the blocks being uppermost. They could be broken up into pieces about 7 inches through and used for the telford foundation to macadam or shell roads.

There are many uses for the old blocks, as they are good for foundation of walls of buildings and other structures for private, public or railway uses. The best of them could be used in connection with sewer construction, especially as bottom courses in brick sewers, as they would not scour away as much as brick from the sewage running over them.

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### BRICK PAVEMENTS AND THEIR EXPANSION FROM HEAT.

**Where can I get official information in regard to the expansion of brick pavements from hot weather? Can it be prevented?**

*M. H. Moseman, Commissioner Public Works.*

Write to the city engineers of Cleveland, O., Marion, O., Terre Haute, Ind., Peoria, Ill., Newark, N. J., Niagara Falls, N. Y., which are some of the places which have had interesting experiences with the expansion of brick pavements. It can be prevented by special means when the pavement is first laid, but it is hard to cure when the evil has been done. Several of the previous issues of this magazine give much information on this subject.

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### REDUCING WIDTH OF STREET PAVEMENT.

**Is it wise to reduce the width of pavement on streets? Our streets are most of them forty feet wide between curbs.**

*A. M. Quimby, Paterson, N. J.*

Yes, in your city and similar ones where traffic is very light. If you are to have asphalt or brick pavements the vehicles go faster and very few will be on the street at a given time. Much money is wasted in paving too great a width of the street. Have your curb or border stones moved out and reduce your street to about thirty feet. You will thus have broader sidewalks, and on residence streets more room for handsome grass plots.

### STREET CLEANING IN BUFFALO.

**We are at present in a worse condition in regard to clean streets than during the past fifteen years in Chicago. Our pavements are very poor, except the asphalt and a few brick streets. These are not cleaned, except those under the park boards. How does Buffalo keep its streets so clean? and at what expense? I hold that Chicago streets must be cleaner and better, if we wish to retain many citizens who retire with their taxable wealth to other cities more attractive than ours. I have facts from your magazine from other cities, but not from Buffalo.**

*Alderman of the — Ward, Chicago.*

Buffalo spends about $160,000 for street cleaning, $150,000 for collection of ashes and garbage, and $35,000 for reduction of garbage, making a total of $345,000 per year. The city has eight districts. The business district is cleaned by the block system, by city labor, at about $30,000 per year. A broom, shovel and push-cart complete the outfit of these uniformed men. City carts pass at intervals and carry off what the block cleaners had accumulated. The amount of surface assigned to each man to clean depends upon the amount of traffic and other conditions. The center district is flushed at night as often as best.

The rest of the city, seven districts, is cleaned by contractors at intervals from daily to weekly as ordered. Sweeping machines are in general use with some hand labor. The records are kept on the basis of the number of "great squares" cleaned once. A "great square" contains ten thousand square feet, the basis on which all bids are received. According to the kind of pavement, the prices range from 26 cents per great square of asphalt to 46 cents for one cleaning of a great square of rough stone pavement.

Snow is removed by contractors where necessary. Certified sworn pay rolls for snow removals are filed with the city and the contractor receives the amount, plus 10 per cent. to cover use of tools, superintendence, etc. Inspectors have much power, but being selected with care, with little or no political influence, the results are good. Ashes and garbage are collected by contractors daily, or less often, according to districts as ordered. The ashes collected by contract cost about 37 cents per cubic yard; the garbage about $1.90 per ton. Buffalo is a clean city, due partly to 200 miles or more of streets being paved with asphalt, and to the fact that efficient, good work, coupled with economy, is enforced without regard to politics.

Upon a basis of 300,000 inhabitants and the above details of cost, the reader can estimate what it would cost to clean his city. All he needs to know is the population of his city, the number of thousand square feet to be cleaned, the kinds and conditions of the pavements, and whether his city officials are competent and honest. He can also get the cost per inhabitant per great square or per square yard of each kind of pavement cleaned; also the cost per person for removal of ashes, garbage, etc.

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### SHOULD A CITY OWN AN ASPHALT PAVING PLANT?

**There has been some talk here of getting our city to erect and run an asphalt paving plant. Do you know of any city which has one? Is such a plan feasible and economical? Would the pavements be well laid and kept in order?**

*M. A. L., St. Paul, Minn.*

Experience in all municipal construction in this country and Europe has demonstrated that while it is best to have such matters as sewers, water-works, pavements, and bridges under the administration of city officials, that it is not best nor economical to have the construction of such work

done by day labor and materials purchased by the city. In a republic where the men in charge of the legislative and executive branches of a city must be changed at various elections, and where many of these men are under obligation and closely connected with their neighbors, it is cheapest and best for themselves and the city to have public work done by contract and awarded to the lowest reliable bidder who has given proper security or a bond that he will do what the specifications require.

We know of no city owning an asphalt paving plant, nor would it be good policy or economical to erect, maintain and operate one.

Good pavements, well and cheaply laid, and properly repaired, can be obtained by having precise specifications carefully prepared, containing all requirements needed to secure a reliable pavement and to safeguard the city. Such specifications can be prepared either by having experienced engineers permanently or temporarily in the employ of the city. A city can easily compel contractors to live up to the requirements of specifications. The security for construction and maintenance can be the retention by the city of a part of the pay for the pavement or deferred periodical payments or a security bond. As to the price to be paid for pavements, that can be limited, as in some cities, to a maximum price in the ordinances and specifications above which bids will be rejected.

The solution of the paving problem is to have efficient specifications and see that they are enforced.

A municipal asphalt plant or factory would mean political influence and a constant temptation to do wrong or at least neglect the interest of the public. A city government to be successful must avoid details of machinery, patents, materials, freight, and the employment of many expert and trained laborers difficult to find and whom the city could not retain in its constant employ.

## BY WAY OF COMMENT.

**Cement Testing Methods.**

Some of the questions asked by the Committee on Cement Tests of the American Society of Civil Engineers have been answered by German experts in *Baumaterialenkunde*, indicating accepted methods in that country, where the matter has had more attention up to this time than anywhere else.

With regard to sampling, the method should depend on the use to be made of the tests, and samples should be taken from the centers of several different packages, says the German answer.

Why should the various samples be mixed, as a portion of this question indicates is the custom with some engineers? One requirement of Portland cement is uniformity. This is secured in the results of tests if the samples are mixed, but no evidence is secured as to the uniformity of the cement in the shipment. Sampling the center of a package is valuable on some accounts, but fails to give the infor-

mation regarding the care the cement has had in handling and shipping which some tests from the outer portions of the package would give. The average of several samples from different parts of a package is logically more nearly correct than the average of samples from the whole shipment, for the cement contained in the one package is well mixed when combined with the sand and the strength of the mortar is measured by the average strength of the whole amount of cement in the batch. In a detailed examination of a brand of cement to determine its value, it is desirable to know the best results that can be obtained from it. In this case all possible advantages in selection of samples should be given the cement. At the same time the question of uniformity is most important and mixture of different samples should not be permitted. The effects of defective packing, neglect or carelessness in protecting and handling the packages should also be studied. In testing the cement on the work these latter questions are the important ones, and samples should be taken in such manner as to give information on them, proper comparisons being made with the best results the cement has shown in the detailed investigation of it.

Chemical analyses are considered desirable by the German when excess of magnesia is suspected, and for mixed cements, methods being left to the individual chemist. Limits of amounts allowable are not stated. Microscopical tests are at present valueless. Density and weight should be determined, but no methods are proposed which will give uniform results by different experimenters, or even by the same experimenter at different times. Tests for fineness do not differ widely from American tests, it being suggested that all the cement should pass a sieve of about 76 meshes to the inch and not more than 20 per cent. should be retained by one of about 180 meshes. Hand shaking of the sieve is most satisfactory, the same treatment being given all kinds of cement in the process. German sands are prescribed, naturally, and methods of mixing are left to the individual operator. Neither is the quantity of water required definitely fixed. Tests for constancy of volume and time of setting are like those prescribed by American specifications.

It is recommended that tensile tests be made on briquettes made 1 of cement to 3 of sand, by weight, using the German form, as the American form may not break at the smallest cross-section. The recommendation of this proportion of sand and cement is excellent. It can not be improved upon for ordinary work, but special requirements may sometimes modify the proportions.

Compression tests are said to give more reliable and more valuable results than tensile tests, being made on square briquettes about 7.75 square inches in area. This conclusion does not agree with

present American ideas, the difficulty of securing uniform results being as yet unsurmounted.

Treatment of briquettes between making and treating agrees with American practice; also age at which briquette should be broken, the times recommended being 7 and 28 days after making. These two seem to give the most information of any two periods that might be selected, and are within the limits of time allowable for testing on all important work

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**Colleges of Commerce.** The first College of Commerce, the need of which was discussed in this department in September, has been established at the University of California, under the charge of Professor Carl C. Plehn as dean. The University of Pennsylvania has sustained for some years a school of finance which undertakes a small part of the work of a college of commerce. The University of Chicago announces the establishment of a similar school, and Columbia University has had one under consideration, but the University at Berkeley is the first to put the idea in full operation.

The university has long had courses in political economy, the histories of commerce and industry, transportation, banking and currency, public finance, international law, modern languages, navigation and astronomy, many technological studies connected with the materials of commerce, and in numerous allied subjects which properly belong to a college of commerce, but they needed the correlation which could only be secured by placing the department under a head who would direct the steps of students, show the modifications necessary in exis ing courses, fill the many gaps existing, unifying the work and making it a complete whole. The dean of the new college has begun the correlating process and is now guiding the first class of students through the course. Meanwhile he is preparing for the new courses necessary and making plans for the museums, correspondents, statisticians and other aids to the collection and presentation of information.

Professor Plehn is explaining the objects and plans of the new school in a series of articles written for the *Merchants' Association Review*, of San Francisco, the first article appearing in the October number. It is apparent from this first article that he has begun the development of the school upon what may be styled the external side of the subject. Without doubt most of the graduates of the school must be satisfied with a knowledge of the details of commercial operations, technical or otherwise, becoming assistants rather than operators, but the manipulator of markets, the originator of great commercial enterprises, the administrator of aggregations of capital, as Professor Plehn well says, must be a man with the broadest mental training and the widest knowledge that can possibly be obtained. In

the past it has been possible for a man of genius to dominate a very large section of the world in his particular commercial line, even though he did not have this breadth of training and wide knowledge. The days for these chances are fast passing away and the establishment of the colleges of commerce will hasten their flight. If, however, the breadth of training is neglected for the sake of the detailed knowledge, the colleges may injure, rather than aid, some of their brightest minds.

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**Rainfall and Stream Flow.**

The state of New York has been studying the conditions of some of its watersheds with reference to the supply of water for the enlarged canals. Mr. Geo. W. Rafter has been in charge of some of these studies and, while the number of years for which data are obtainable is too small to make the results certain, he has been able, through comparison with other similar collections of greater extent, to draw some interesting conclusions.

He contrasts the proposition advanced a few years ago, that forests have little effect upon stream flow, and contends that the data are not sufficient to uphold it, while some data are somewhat contradictory. Without going into the details of his argument, the resulting conclusions may be stated—various crops require varying amounts of water, trees requiring the least.

In the investigation of one such watershed it was computed that the growing crops would require 3.4 inches more rain during the growing season in 1890 than in 1850, on account of the decrease in forest area from 40 per cent. to 9 per cent. and the changes in character of crops. It has been shown frequently that evaporation is practically constant, being almost independent of the variations in rainfall. This increase in water required for crops must therefore reduce the run-off in the streams. When it is known that the mean rainfall in and near this watershed during the growing season is from 8 to 13 inches, and sometimes falls to 5 inches, the reasons for low water in streams during the summer, and for failure of water powers formerly of value, are seen.

A balancing of conditions whereby an increase in rate of melting snow on deforested area offsets a larger amount of snow remaining to be melted in a forested area, and a dryer soil in a deforested area offsets the many retardations of the flow of water in a forested area with ordinary rains, makes the effect of removing forests upon flood heights inappreciable.

Forested areas are thus shown to be the most productive of water for a given rainfall.

Mr. Rafter's studies did not reach prairie streams. Here he would have found conditions materially different. The original condition was treeless, and there has been a slight increase in forest area. The areas being flat or

slightly rolling, with frequent sections without adequate outlet, many swamps existed, or were formed during rainy seasons, to disappear by evaporation. These materially retarded the flow of water so that evaporation took place from large areas of water, or of wet soil. In the process of settlement and development the swamps have been ditched and the fields underdrained, free outlet being given to the water. Evaporation has thus been diminished, there being more dry soil exposed to the air, and less area of water and swamp. Run-off has been increased a corresponding amount. Flood-heights have been materially increased by the greater facilities for drawing water rapidly to the streams. Snow conditions are not modified materially except in the small city areas, and the present crops perhaps require slightly less water than the original prairie growth.

Each state has its own peculiar conditions and must be studied independently. Mr. Rafter's observations are valuable for New York and for the same conditions elsewhere. His arguments are ingenious and his conclusions correct with the reservations he makes regarding insufficient data, but they must not be applied blindly to the different conditions in another state.

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**Filtration of Water in Philadelphia.** Mr. Trautwine is continuing his laudable efforts to convince Philadelphia that the restriction of waste is an important part of the pure water problem in that city. Slow sand filtration is proposed. Mr. Trautwine shows that about one fifth of the population is wasting two-thirds of the water furnished and that a judicious expenditure for meters of $500,000 to $1,000,000 will prevent this waste. The economy of this expenditure is evident when it is shown that the cost of a filtration plant for the water used and wasted is, like the amount of water, three times that for water properly used. Nearly five million dollars must be expended in addition to the cost of filtration in extensions and improvements, on the present basis of waste, while a little more than one million is all that would be necessary without waste. Similarly, including the cost of maintaining meters, the cost of operation on the present basis is twice that on the proper basis. The difference between the installation of meters, filtration plants with required real estate and other requirements for a surplus of about 100 per cent. in pumping capacity ($4,605,500) for a supply with the waste restricted, and the same, except meters, required for the present use and unlimited waste ($12,509,500) is nearly $8,000,000. This sum is large enough to warrant the closest study of the problem.

While Mr. Trautwine's estimates may not be entirely unbiased, there is not the least question that the principle upon which he bases his argument is correct. Why should four-fifths of the city, largely made

up of the smaller tax-payers, be required to pay for the wanton waste of the small number of consumers who are guilty of this wholesale theft or criminal negligence? The fact that they pay large sums for the water used legitimately is no argument for permitting the waste of vast amounts of water for which there is no excuse. The argument that water should be as free as air, is too far out of date to be heard with patience. Certainly water is as free as air if one goes where the water is. Water taxes are not in payment for the water, they are only payment for the labor and expense of bringing the water to our doors. In the days when water is carried in carts, no one claims that the cost of water used or wasted by one man must be paid for by another. Each pays for the water delivered to him. Doubtless the large consumer pays less per gallon than the small consumer, but he pays for all he gets, and pays what it costs to get the water to him with a reasonable profit to the carrier. In what way is the supply of water by a city water-works system different in principle? It differs in fact only as the cost of delivery of water is so much decreased.

The use of meters cuts off the waste, but does not restrict the legitimate use of water. In fact, general experience shows that the introduction of meters usually leads to a very material reduction in water taxes, as soon as the leaks and careless practices which caused useless waste of water were discovered and stopped, without in the least interfering with the freest legitimate uses.

On a small scale this is shown in the city of Bloomington, Ill. Many houses now have a tax less than half that under the flat rates. To be sure the revenues of the water department are reduced, but so are the expenses in even greater ratio, so that the city's funds are not injuriously affected.

So valuable a reform is almost too much to ask of Philadelphia, which has given such recent evidences of the lack of knowledge among its law-makers of the first principles of municipal economy or even of common honesty. Mr. Trautwine's courage and perseverance are deserving of the greater commendation on this account.

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**Central States Water-works Association.**

The proceedings of the first convention of the Central States Water-works Association showed sufficient interest in its objects to justify the efforts of its projectors. Although the actual registration was small, the attendance at the meetings was quite satisfactory. Although four or more states were represented, it is evident from the list of officers that Ohio is in full charge of the organization. There is a good field for such a society as this in Ohio and the adjoining states, and while considerable missionary work may be necessary for a few years, perseverance and patience will finally have their reward. The district

covered by this society has many problems which are peculiarly its own, and the technical investigations will not be duplications of those in other societies, such as the New England Water-works Association, as most of them will differ either in the nature of the problem or the detail of its application. The New England society has materially elevated the standard of water-works operation in its district and the principal work of the new society will be in this line. Even if its field is restricted to the state of Ohio there will be plenty of work to do and plenty of water-works men to interest and to assist. As soon as the value of the society is made apparent by the work it does there will be plenty of requests for membership from the adjoining states. Good work in a good cause is always appreciated. The next meeting of the convention will be held in Cincinnati. John Fisher, of Hamilton, is the secretary.

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**A Municipal Lighting Contract.**

The new lighting contract of the city of Boston contains many of the features of municipal control of what may be termed a natural monopoly which have been recommended frequently by this magazine. The contract fixes the price to be paid by the city for arc lights, within certain limits, proportional to the number of lights, and provides for readjustment of this price at intervals of five years, or of two and one-half years if the mayor demands it, so as to keep the net earnings of the company at 6 per cent. or less if the company's bonds are placed at a less rate. There is no regulation of rates to private consumers, and apparently no agreement to refuse franchises to other companies. The expenses are divided between the public and private lighting in proportion to the electrical power developed for each class of business, and the percentage of net earnings is computed from the earnings of the city lighting plant and the capitalization of that portion of the plant. Seven per cent. depreciation is allowed in determining the expenses of operation. Evidently the desire is to separate the municipal and private business as much as possible and to retain close control of the former, leaving the latter to the regulation of the company. The rates to private consumers may be fixed at pleasure by the company, and the profits of this portion of the business may be quite different from the 6 per cent. permissible on the city's business. Certain detailed technical demands are made on the company, one being that if the commission on rates reports that any new invention would reduce the cost of production of light or increase its efficiency, the company must introduce it or its equivalent, or the city may demand the estimated reduction in price which would presumably result by its adoption.

So far as public service is concerned, this places about all the restrictions on the company to which it should logically be subjected. It

leaves the private business of the company unrestricted. Electric lighting is not strictly a natural monopoly, though restriction of service to a single company is by far the most convenient and satisfactory. If the monopoly of private business is not granted to the company, but the field is open to others who offer proper guaranties to the city authorities, no restrictions of the company's private business need be demanded. The contract seems to be quite satisfactory, and in the present condition of municipal government in this country is probably a better method of securing good service than municipal ownership.

## LEGAL DECISIONS.

[Reported Specially for MUNICIPAL ENGINEERING.]

Right of Company as to Discounts—One entered into a contract with a lighting company whereby, in consideration of his agreement to take light for five years, he was to receive a certain discount on his bills. The discounts were allowed monthly. On his refusal to continue use of light within the five years the court held the company had a right to recover from him the discounts that had been allowed. Mo. Elec. L. & P. Co. vs. Carmody, 72 Mo. App. Ct. Rep. 534.

City Not Liable for Unexpected Freshets—Where a city has provided sewers or drains of ample capacity to carry off all water likely to fall or accumulate upon its streets on all ordinary occasions, it is not guilty of negligence in failing to anticipate and provide for extraordinary and unexpected stroms. Peoria vs. Adams, 72 Ill. App. Ct. Rep. 662.

City Responsible for Defective Methods of Construction—For a method of street construction which, under the natural and ordinary action of the elements, will render street travel dangerous, a municipality is justly subject to liability, when the dangerous condition arises as if it had actually created the dangerous condition in the first instance, without the intervention of the weather. Lehmann vs. City of Brooklyn, 51 N. Y. Supp. Rep. 524.

Power to Repave Streets—A power "to pave again any street on which the pavements are worn out and useless" necessarily carries with it the power to repave only portions of the street if the pavements are worn out on such portions. Burckhart vs. City of Atlanta (Ga.), 3 S. E. Ren. 32.

Measure of Damages for Change of Grade of Street—The measure of damages to a lot caused by a change of grade of the abutting street is the diminution in the value of the lot caused by such grading, less any special benefit that may have thereby accrued to the lot. Kent vs. City of St. Joseph, 72 Mo. App. Ct. Rep. 42.

Lien For Improvement, Though Assessment Is Invalid—If a sewer system is laid according to law there is a lien on the lands for the cost, although the assessment was invalid. Smith vs. Abingdon Sav. Bank (Mass.), 5 N. E. Rep. 545.

Assessments For Improvements Presumed to Be Regular—Assessments for public improvements are presumed to be regular; and in the absence of substantial injury courts will not be overzealous in finding technical reasons for declaring them invalid. Providence Retreat vs. City of Buffalo, 51 N. Y. Supp. Rep. 654.

# PERSONAL INFORMATION.

SCHENCK—Mr. Martin Schenck, city engineer of Troy, is the Democratic nominee for State Engineer and Surveyor of New York. He is a descendant of an old Dutch family, and was born forty-seven years ago. He was graduated from Union college in

MARTIN SCHENCK, C. E.

the class of 1869, and plunged at once into work as a civil engineer on the Sedalia branch of the Missouri, Kansas & Texas railway. For a year he held an important position on the Union Pacific railway, and as engineer in charge constructed a number of bridges along the line in the Indian territory. In 1872 he was engineer for the contractors who were building the third and fourth tracks on the New York Central railway. About this time he was appointed and acccepted the position of engineer on the Callao & Lima railway in Peru, but the death of his father forced him to abandon the enterprise. From 1874 to 1880 he devoted his time exclusively to hydraulic engineering and waterpower improvements. For a time he was employed by the contractors who were constructing the West Shore railway. From 1883 to 1891 he was attached to the Canal department and was intrusted with many important pieces of work. For four years, from 1887 to 1891, he was engineer in chief of the Hudson river improvement, and the lengthening of the locks in the eastern division of the canal was done under his direction. In 1891 he was nominated for State Engineer and Surveyor and was elected by a plurality of 41,916 over Verplanck Colvin.

After his term as state engineer and until May, 1895, he was consulting engineer to the state board of health and since May, 1895, he has been city engineer of Troy, N. Y. He has at various times been connected with the state national guard as follows: From 1864 to 1869, private in Fortieth regiment; from 1875 to 1877, brigade quartermaster with rank of captain in the Thirteenth brigade, and in 1894 he was appointed chief of engineers with the rank of brigadier-general on the staff of Governor Flower. He was born at Palatine Bridge, Jan. 24, 1847, received his early education in the schools of his native town, prepared for college at the Union school, Schenectady, and entered Union college in the fall of 1865.

ANDREWS—Mr. Horace Andrews, the city engineer of Albany, N. Y., author of the paper on "The Proper Curbing of Streets," read before the convention of the American Society of Municipal Improvements, and which appears in full in this number of Municipal Engineering, has held the official position which he now occupies since 1886. During that period several millions or dollars have been expended on public work under his supervision in Albany, and in its engineering features the Albany of today is largely his creation. He was graduated from the Sheffield Scientific School of Yale university, with the degree of civil engineer, in 1872. In that year he was engaged on hydrographic work, under the United States Coast and Geodetic Survey, and for several years afterward was connected with the same work,

HORACE ANDREWS, C. E.

first in connection with the survey of the harbor and vicinity of New Haven, Conn., and afterward on the east coast of Florida. He was called from Florida in 1878 to accept a position as assistant on the New York State survey, which he filled till the conclu-

sion of the work in 1884. He was then engaged in sanitary investigations under the State Board of Health of New York till his appointment as city engineer of Albany.

JENKINS—Mr. Warner H. Jenkins, C. E., contributor of the articles in the October and November numbers of Municipal Engineering on "Concrete Aggregates," has had many years of practical experience in the line of work which he writes about. He is a native of Philadelphia, and is about thirty-six years old. He graduated from the senior class of Newton school, 1879, and entered the University of Pennsylvania the same year. He finished a scientific course at Lauderbacher Academy in the fall of 1882. In 1882 he was appointed superintending engineer by the Portland Paving company of Delaware, at the same time holding the position of consulting engineer to the Empire Construction company of New York. He

WARNER H. JENKINS, C. E.

resigned these positions in 1888 and formed the Warner H. Jenkins company. Among the large and important operations, coming directly under his supervision, were the Pennsylvania Institute for the Blind, the Officers' and Engineers' Quarters at Fort Hancock, N. J., Broadway M. E. church and Ivy Hall building, Princeton, N. J. He was the first in his city to successfully demonstrate the practicability of concrete for foundation walls for large buildings in the construction of the Harrison building in 1894. He is the inventor of the methalithic system of paving and has laid millions of feet of street and sidewalk paving in different sections of the eastern states, and introduced granolithic in the New England states. He has been retained as an expert on many of the litigations touching upon the use of concrete.

WARING—Col. George E. Waring, M. Inst. C. E., consulting engineer of Newport, R. I., and famous as the stret cleaning commissioner of New York who cleaned the streets, has been in Cuba, by appointment of the government, investigating the sanitary condition of the localities where troops will be located when the American army enters the island. He will report recommendations for needed improvements in sanitary conditions.

CASE—Capt. L. N. Case, who, through unworthy political influences, was deposed from the position of superintendent of the Detroit water works after thirty-one years of efficient service, as stated in this department in the September number, has been appointed manager of the water works at Duluth, Minn., succeeding Mr. C. E. Van Bergen, who resigned.

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**Personal Notes.**

R. M. Clayton, M. Am. Soc. C. E., has been re-elected city engineer at Atlanta, Ga.

A. R. Starkey, Marquette, Mich., has been appointed superintendent of water works at St. Paul, Minn.

Edwin Darling, formerly superintendent of water works at Pawtucket, R. I., died recently, aged sixty-four years.

George K. Crandall has been re-elected city surveyor and Alfred H. Chappell water commissioner at New London, Conn.

Thomas Fuller, late chief architect of the department of public works, Ottawa, Ont., died Sept. 28, aged seventy-six.

C. W. Hubbell has been appointed civil engineer to the water board at Detroit, Mich., to succeed Gardner S. Williams.

Herman Schussler has been made honorary professor of water supply engineering in the University of California, Berkeley, Cal.

Stevenson Towle, M. Am. Soc. C. E., has resigned his position as consulting engineer of the department of highways, New York City.

James W. Cheney, South Manchester, Conn., has been appointed a commissioner of the Connecticut bridge and highway district.

J. W. O'Neil has been appointed receiver of the Topeka Water company, Topeka, Kas., to succeed Elias Summerfield, resigned.

Charles Edward Widener, C. E., and city engineer at Cumberland, Md., in 1893 and 1897, died in that city, October 11, aged forty-five years.

C. G. Edwards has been appointed assistant engineer and Raleigh Thomas chief draughtsman of the subway commission of Baltimore, Md.

Charles E. White, electrical engineer of Philadelphia, Pa., has been appointed manager of the municipal light board, Wakefield, Mass.

David R. Lee, Asso. M. Am. Soc. C. E., has been appointed supervising engineer in the construction of the Bleecker reservoir at Albany, N. Y.

A. C. Bell, city engineer of New Orleans, La., has been studying asphalt pavements in Washington, New York City, Troy, Syracuse, Detroit and Chicago.

H. E. Wells, Columbus, Ind., has been appointed superintendent of the water works and electric light plant at Rushville, Ind., to succeed A. T. Mahin, resigned.

Frank A. Foster, C. E., Dorchester, Mass., is a candidate for the state legislature of Massachusetts. Mr. Foster served for fifteen years in the office of the city engineer of Boston.

Major-General Francis V. Greene, U. S. V., has been ordered to report to Major-General Lee, Jacksonville, Fla., for assignment to the command of a division of the Seventh Army Corps.

W. S. M. Kirchofer has resigned his position as city engineer at Baraboo, Wis., and has been engaged at Superior, Wis., to analyze the city's water and to suggest plans for purification.

Henry Goldmark, M. Am. Soc. C. E., has been elected secretary of the Detroit Engineering Society, to succeed Gardner S. Williams resigned. Mr. Williams has removed to Ithaca, N. Y.

John P. Kelly, C. E., Troy, N. Y., died Sept. 27. Mr. Kelly was a graduate of the Rensselaer Polytechnic Institute, had been an engineer for the public improvement commission and assistant state engineer.

Walter H. Richards, engineer of sewers at New London, Conn., has been elected superintendent of water works. Mr. Richards was constructing engineer of the New London water works, and on their completion was appointed superintendent, which position he held for twenty-two years. His impartial administration gave offense to some persons, and five years ago he was retired from office on a change in the city administration. His reinstatement by the new council is regarded as a righting of a mistake due to bad politics.

A. S. Crane, Jun. Am. Soc. C. E., has resigned his position as assistant engineer of the department of sewers, Brooklyn, N. Y., and accepted that of assistant engineer of the American & Lake Superior Power Co., Sault Ste Marie, Mich.

R. Krumm of Columbus, O., has been engaged as chief engineer of the Corean government, and will direct all engineering work, such as laying out of irrigation works, roads, bridges, fortifications, etc.

William Jackson, M. Am. Soc. C. E., city engineer at Boston, Mass., has gone to Europe to examine and study certain bridges for the purpose of obtaining information for use in connection with his work as engineer of the Cambridge bridge commission.

G. H. Dunlop, C. E., Melbourne, Victoria, Australia, is in this country studying American methods and machinery for the excavation and handling of material, including steam shovels, grading machines and conveying plants, with a view to introducing them in Australia. Mr. Dunlop is the inventor of a new form of wooden lining for tunnels, which has been used in the construction of sewer tunnels in Melbourne.

# CURRENT INFORMATION.

### New Tenants Not Liable for Water Bills of Old Tenants.

A decision was rendered recently by Justice Childs in the special term of the supreme court, in the case of the receiver for the Busch Brewing company against the Municipal Board of Tonawanda, N. Y. The suit resulted from the refusal of the board to turn the water on at the brewery because there was an unpaid water bill, contracted previous to the appointment of the receiver, which the receiver refused to pay. Justice Childs held that the board could not hold the new tenant responsible for the bills of the old tenant, and that it had no right to deprive the new tenant of the use of water because the old tenant's bill was not paid.

It would seem that this decision would be far-reaching and compel other cities to abandon that method of collecting unpaid water bills. Buffalo, however, whose rule for years has been similar to that declared illegal by Justice Childs, seems to consider the decision irrelevant. Scores of cases can be cited, it is claimed, where a new tenant moving into a house, has found that the previous occupant did not pay the water bill, and that before the new tenant could get the water turned on the bill would have to be paid. Generally, the new tenant would pay the city for the water, supposing he had no redress. It is probable that another test case will be taken before the court before the question will be finally settled.

### Meeting of Central States Water Works Association.

The first annual convention of the Central States Water Works association was held at Springfield, O., Sept. 27-29. In a paper on electrolysis and water supply J. J. Pater, Hamilton, O., made a plea for greater attention to the damages to water pipes due to wandering currents from electric railways. The executive committee for the coming year was appointed a committee to investigate the subject thoroughly. In the portion of his paper pertaining to water supply Mr. Pater called attention to the pollution of streams by sewage, and urged some action toward preventing it. B. H. Flynn, Columbus, O., inspector of water supply of the State Board of Health, also discussed this subject.

President O'Shaughnessy, Columbus, O., described the filter conduit which is being constructed for that city. Mr. Pater discussed also "The Perforation of Pipes."

"The Idiocies of the Water Consumer" was discussed by C. W. Wiles, Delaware, O., in which he pointed out the unreasonable demands made by some people who are given the best of service, and giving as an instance a case where complaint was made of bad odor in the water, which proved to be due to bad plumbing.

John Fisher, Hamilton, presented a paper on "Repairing a Break Under Eighteen Feet of Water." H. Stillwell, Marion, O., discussed "Misuse of Water in Flushtanks," and J. J. Hopper, Springfield, "Sanitary Condition of Water Supply."

Officers for the ensuing year were elected as follows:

President—G. R. Cook, Toledo, O.
First Vice-President—C. W. Wiles, Delaware, O.
Second Vice-President—Jas. P. Meloy, Sidney.
Third Vice-President—Geo. S. Cotter, Springfield.
Fourth Vice-President—A. W. Inman, Massillon.
Secretary—John Fisher, Hamilton.
Treasurer—Chas. E. Rowe, Dayton.
Editor—J. J. Pater, Hamilton.
Executive Committee—Wm. A. Veach, Newark; C. W. Koons, Mt. Vernon; Jerry O'Shaughnessy, Columbus.
Finance Committee—W. B. Mitchell, Piqua; Jas. P. Meloy, Sidney; C. F. Martin, Bellefontaine.

The next meeting of the association will be held in Cincinnati.

### Sources of Water Supply in Ohio.

A preliminary report of the investigation of rivers and deep ground waters of Ohio as sources of public water supply, has been issued by the Ohio State Board of Health. The Mahoning river above Youngstown was found to be simply one vast sewer. The sewerage of Youngstown reaches the Mahoning river, but has not yet polluted it to an extent to cause serious complaint. No town in Ohio draws a water supply from the Mahoning river below Youngstown.

### Reduction of Water Rates at Kansas City.

A horizontal reduction of 15 per cent. in water rates to all consumers has been determined upon at Kansas City, Mo. An ordinance was passed, Oct. 3, by the upper house of the council, which goes into effect Jan. 1, 1899. The reduction applies to meter rates as well as all others and on the basis of the revenues for last year it will reduce the revenues from the plant between $60,000 and $70,000. As the consumption of water is constantly increasing, the reduction for the current year will amount to about $55,000. This is offset to the extent of about $25,000 by the new business which the special rates ordinance will effect. An amendment has been adopted providing that the horizontal reduction does not apply to the special rates fixed by the special rate ordinance. This special rate ordinance, brief mention of which was given in the October number of Municipal Engineering, provided a rate of 5 cents per 1,000 gallons to all consumers using between 10,000,000 and 25,000,000 gallons of water a month, and 4 cents for more than 2,500,000.

### City Must Pay for Public Use of Water Under Municipal Ownership.

An opinion was prepared by Assistant Corporation Attorney Taylor, Oct. 6, for the board of water commissioners and the board of aldermen of St. Paul, Minn., in which he holds that the various city departments will have to pay for water furnished them the same as private persons. The city is charged with $418,088 for water used through fire hydrants from Dec. 1, 1891, to June 1, 1898.

### Water Filtration at Hamburg.

Considerable attention was devoted to filtration by Senator William Flinn of Pittsburg, Pa., while on a recent visit in Europe. The sand filter in operation at Hamburg interested him particularly. He said the water when first taken from the river is quite filthy, and when it comes out of the filter is as clear as crystal. The plant has a capacity of 60,000,000 gallons of water a day, and cost $4,000,000.

### A City Allowed to Enter the Territory of a Private Water Company.

In an application of the North Springs Water company for an injunction restraining the city of Tacoma, Wash., from extending its mains to the territory alleged to be covered by the Fuller and Mullen franchises, Judge Carroll ruled that the city cannot be estopped from entering the field of any rival water plant it may choose, but it cannot take or destroy the property of such plant without due compensation. Judge Carroll said, in part, there is no obligation resting upon the holder of either of these franchises compelling it to put in any water works; the city has said to it, "you may put in water works," but it has not said "you are compelled to do so." No bond has been required; the holder of the franchise may put down pipes on one street and not upon another; he may supply the people upon one street and not upon another; he may shut down his works at any time and remove his plant; he is not compelled to continue for

any length of time; the city receives nothing in return for the privilege except it be the right to make uniform rates at which water shall be furnished by such corporation, company or individual. While the franchise granted is a contract—and the city is bound by it, and whatever interpretation it may have, whatever rights are granted by it, the plaintiff is entitled to them—yet it is not of the character of a contract under which courts have held the city estopped.

### Average Daily Consumption of Water Per Capita in English Cities.

An official statement of the average daily consumption of water per capita in a number of the leading cities of England, including the average for the several water companies which supply London, is as follows:

| | Gallons per head. |
|---|---|
| Grand Junc. (London) | 55½ |
| Chelsea (London) | 47 |
| Southward and Vauxhall (London) | 45 |
| Brighton | 43 |
| Plymouth | 43 |
| Hull | 43 |
| London (average) | 41 |
| Lambeth (London) | 40 |
| West Middlesex (London) | 39 |
| New River (London) | 35½ |
| Bradford | 35 |
| Leeds | 35 |
| East London (London) | 34½ |
| Preston | 34 |
| Kent (London) | 33½ |
| Liverpool | 31½ |
| Croydon | 31 |
| Manchester (aver 27) | 30 |
| Halifax | 29 |
| Swansea | 28 |
| Blackburn | 25 |
| Bristol | 23½ |
| Bolton | 23½ |
| Birmingham (average) | 23 |
| Huddersfield | 23 |
| Burnley | 23 |
| Oldham | 22 |
| Cardiff | 22 |
| Sheffield | 21¾ |
| Nottingham (aver. 17½) | 19 |
| Birkenhead | 18 |
| Leicester | 18 |

### Information About Water Works in Europe.

The Philadelphia Commercial Museum is compiling detailed information regarding the water works systems of Europe. A series of questions was prepared and submitted to the Water Department of Philadelphia for revision and suggestions. The Water Department returned the questions with a number of valuable suggestions. These were embodied in the request for information sent to the heads of water works in thirty of the most important cities in Europe, covering Great Britain, France, Germany, Russia, Italy, Switzerland, Austria and other countries. Exhaustive replies have been received so far from Manchester, Birmingham, Liverpool, Glasgow and Cardiff in Great Britain, and from Frankfort-on-the-Main, Nuremburg, Zurich and Geneva. The replies give voluminous information about the cost, methods of operation and results, with full descriptions of filtering and purifying plans where they are in use. Annual reports of operations accompany the replies of some cities to the questions.

### Proposed Investigation of Water Contracts in New York.

The private water companies in New York City have been brought into prominence by Edward M. Grout, president of the borough of Brooklyn, who introduced a resolution recently asking that the department of water supply investigate the terms of the contracts which these private concerns furnishing water within the city limits hold. Mr. Grout favors the acquisition of the plants, and in time placing within the city authorities' hands full control of the water supply in the five boroughs of Greater New York.

### A Court Decision on Sewer Assessments.

Judge Spiegel has rendered a decision in a suit against the city of Cincinnati to recover the amount of the assessment for the construction of the Denman-st. sewer. The plaintiffs objected to the payment of the assessment because their property had local drainage, and the improvement, therefore, was unnecessary; also, because the entire length of Flint-st. had been included in the original assessment to be levied upon the district through which the Denman-st. sewer was built, but in the ordinance Flint-st. was excepted and the cost placed on the other property-owners in the sewer district. Judge Spiegel held that lots or lands not needing local drainage meant lots or lands so situated as to drain themselves by natural drainage into rivers, creeks and other receptacles. He found, from the evidence in the case and from a personal inspection, that there were no improvements on the lots, and, therefore, no sewer was needed; but he found them not to be within the exception, for the reason that the specific power granted a city to construct sewers has, also, a higher aim, namely, the proper sanitation of the entire city and the health and comfort of its entire population, and the lots in question must be held to bear their proportion of the burden to the end that the health of the city may not be impaired, and when improvements are made on the lots

they will receive the benefit of the sewering done by the direction of the city. He found further that the natural rule of law underlying assessments was based on benefits to the taxpayers who paid the assessments levied. When taxed for the building of a sewer which drains an entire district their benefit is that of an adjoining lot owner who is taxed for the special benefit he derives from the sewer; but when it is proposed to tax him for the benefit of tax-payers on a street which is excepted, yet which is within the sewer district, this rule of law does not apply and there ought to be a reduction of the assessment. Judge Spiegel directed the reduction to be in the proportion that the excepted street would bear to the whole district, about 70 cents per front foot, and that that amount be paid to the contractor out of the general sewer fund of the city, which excepted the street from the burden it should have been made to bear.

### Damage Suits May Be Brought Annually Until a Sewer Is Built.

The suit of Dowling vs. the city of Chattanooga, in which the city sought to enjoin Mr. Dowling from bringing further suits on account of the Washington-st. sewer, contending that he had, in previous suits, recovered damages in excess of the value of the property, the supreme court dismissed the injunction, thereby allowing Mr. Dowling to bring a new suit each year on account of this sewer. This decision, together with a previous decision regardng the same sewer, wherein it was held that a tenant on property affected by the sewer could recover damages, will render imperative the immediate building of the sewer.

### Pollution of the Mississippi by Chicago.

A resolution has been adopted by the board of health of St. Louis, Mo., asking Congressman Bartholdt to introduce in Congress a bill to stop Chicago from emptying its sewage into the Illinois and finally into the Mississippi. The medical members of the board, Drs. Starkloff, Hughes and Grill, agree in the opinion that the effect of the operation of the canal will be to pollute the water supply of St. Louis.

### Chicago Property-Owners Will Seek Information About Improvements.

A plan of investigation of public improvements in Chicago, Ill., will be formulated by the public service committee of the Real Estate Board of that city. Chairman C. H. Millikan and Robert C. Givens have prepared a schedule of the resolutions adopted as follows:

To investigate cost by private contract by reliable contractors of different sections of the country.

Cost of laying plank, cement and stone sidewalks.

Cost of paving streets with vitrified brick, asphalt, macadam, cedar blocks and granite blocks in places where there are the same facilities as in Chicago.

Cost of various foundations under these pavements.

Cost of laying tile drains and building sewers of various kinds and dimensions.

Cost of erecting lamp posts of various kinds and connecting same with mains in streets.

Cost of laying water mains and laterals; also stubs connecting lots with mains in streets.

The board of local improvements will make a statement with reference to the cost of street improvements in Chicago. Exception was taken to the action of the Real Estate Board by Commissioner McGann, who asserts that improvements cost less in Chicago than in any other city in the country.

### Electrolysis in Logansport.

The recent investigation of the electrical experts for electrolysis in the underground pipe system in Dayton, O., led City Engineer Osmer of Logansport, Ind., to make an investigation of the pipes in that city. Honeycombed pipes had caused the city much annoyance for several years, but the trouble was attributed to an inferior quality of pipe. In excavating for repairs to the natural gas mains Oct. 8 City Engineer Osmer found that nearly 70 per cent. of the current from the street car rails is passing along the pipes, and that some of the pipes are affected which have not been underground three years. One piece several feet in length was taken out, which resembled an old, rusty piece of iron eaten full of holes.

### Cable Cars Blockaded in St. Louis by the Caving In of a Sewer.

Sewer Commissioner Colby at St. Louis, Mo., kept the cars of the Broadway cable line at a standstill for nearly two hours Oct. 7. A sewer caved in on the west side of Broadway near Palm, and a wagon and two horses were thrown into the hole. When Commissioner Colby arrived on the scene of the accident the Broadway cars were running by the cave-in, which was fully fifteen feet deep. Passengers, not realizing that the break was liable to extend and ingulf the cars and all on board at any minute, leaned from the car steps and gazed into the deep hole. Commissioner Colby gave orders to

stop the running of cars. The superintendent refused to comply with the order and motioned a car to come ahead. Commissioner Colby thereupon threw a timber across the track and deliberately stood upon it, effecting a blockade of the road. The officials of the company pleaded that the stoppage was costing them $100 an hour, and offered to assume all responsibility entailed by allowing the cars to proceed, but Commissioner Colby remained obdurate. He did not permit it until the horses had been removed and the dirt walls well braced.

### Legal Difference Between "Ordinary Repairs" and Repavement.

The supreme court of Nebraska handed down an important decision recently in the case of Edward L. Robertson vs. the city of Omaha. The suit grew out of the repaving of Leavenworth-st. with brick. The street was originally paved with wooden blocks, which wore out in a comparatively short time. The council, acting on a petition of the property owners, ordered the blocks torn up and brick pavement laid. The costs of the improvement were assessed against the adjoining property. Several property owners objected to the assessment and brought suit to have it declared illegal. The district court decided against the plaintiffs and the supreme court has affirmed this decision. The contention in which the city was most interested was that the repaving was "ordinary repairs," the cost of which, under the charter, cannot be assessed against the abutting lot owner, but must be paid by the city. The court holds that the costs of "ordinary repairs" must be paid by the city, but that the tearing up of worthless blocks and replacing them with vitrified brick laid "on the old base" is not an "ordinary repair" within the meaning of the statute, but is a repavement of the street. To pay the costs, therefore, a special assessment may be made against the adjoining property. The importance of the decision lies not only in the fact that the cost of the Leavenworth-street paving can be assessed against the property owners, but also because the city council has acted similarly in repaving other streets.

### Duty on Imported Asphalt.

The Treasury department has announced the decision of the Board of General Appraisers on the protest of F. F. Hicks, Boston, importer of rock asphalt. The asphalt imported came from Barbadoes and was a dark, coarse, sticky-looking earth, invoiced as "500 bags asphalt earth." On importation it was assessed for duty at $1.50 per ton, under paragraph 93, act of July, 1897, as crude asphalt not specially provided for. The importer protested against this assessment of duty, claiming that the asphalt was dutiable as crude earth, at $1.00 a ton, in the same paragraph. The United States chemist has reported that the earth is "a limestone asphalt, containing 6.8 per cent. of asphalt bitumen." Paragraph 93 contains a provision for "limestone rock asphalt containing not more than 15 per cent. of bitumen, fifty cents per ton." The Board of General Appraisers therefore hold that the merchandise is dutiable, not as crude asphalt nor as as crude earth, but as limestone asphalt, at 50 cents a ton. The protest of the importer is therefore overruled.

### The Paving Company Must Be Paid in Full.

The supreme court decided against the city of Chattanooga, Tenn., Oct. 8, in the case of the Southern Paving company, which sued the city for the balance of $6,000 held back by the board of public works on the Whiteside-st. paving contract. The board contended that the paving did not meet the specifications of the city, and declined to pay the 10 per cent. held back. The chancellor decided in favor of the city, but the court of appeals reversed the decision and the supreme court sustained the latter decision. The city will be compelled to pay the $6,000 and six years' interest to the assignee of the paving company, amounting, with costs, to more than $8,000.

### Proposed Comparison of Asphalt Pavements.

The discussion of the asphalt question by the contract committee of the General Council at Louisville, Ky., resulted in the Barber Asphalt Paving company offering to lay one-half of Third-st., in front of the Board of Trade building, if the Breckenridge company will lay the other half, in order that the two pavements may be compared.

### Study of Questions Relating to Paving Brick.

The successful contestant for the scholarship in the department of ceramics of the Ohio State University was Ross C. Purdy of Buffalo, N. Y. The scholarship, which was established by the National Brick Manufacturers' association, involves an investigation along some special line of clay working. What this line is will be determined by a vote of the members of the association, to obtain which ballots have been sent out. A list of subjects, from which one is

to be selected, is proposed on the balloting paper, but the voter is permitted to suggest some other subject in place of these. The list is as follows:

1. Investigation to determine the influence of weathering on brick subjected to the rattling test.
2. Investigation to more carefully determine the feasibility of using mixed charges of iron and brick in the rattler test.
3. Investigation to determine the best form and dimensions for paving brick, in order to enable them to endure the standard rattler test.
4. Investigation to determine what effect the process of manufacture may have on the ability of burned clay to resist frost.
5. Investigation into relation between a clay's composition and its speed and safety in drying.

### Good Roads Meeting at the Omaha Exposition.

The National Road Parliament met Oct. 8 in the Nebraska building at the Transmississippi Exposition, Omaha, Neb. A ;permanent organization was effected, with the Hon. Martin Dodge of the bureau of inquiry, Washington, D. C., as president, Prof. W. M. Hays of Minnesota, secretary, and A. B. Dunning of Pennsylvania, recording secretary. D. V. Purington, Galesburg, Ill., read a paper on "Good Roads," in which he held that no country had done so much for internal improvement and so little for external improvement as the United States. He favors congress taking up the matter of good roads and making proper appropriations to carry on the work of investigation through the department of agriculture.

Resolutions bearing on the subject of good roads were introduced by Thomas Shackleford of Missouri, W. M. Hays of Minnesota, Prof. Luten of Purdue university, Lafayette, Ind.; Otto Dorner of Milwaukee, E. G. Harrison of New Jersey and James R. Dunn of Ohio. In a paper on "State Aid to Roads and League of American Wheelmen Work" Otto Dorner, chairman of the national committee for highway improvements of the League of American Wheelmen, cited the fact that it now costs 25 cents per ton to transport one mile in this country, owing to bad roads, while in Europe it costs only 8 cents per ton.

Gen. Charles F. Manderson, ex-president of the Good Roads Association, said the towns as well as farmers make mistakes in laying out streets and roads on section lines due east and west, when many times, by varying the lines, nature would have provided better streets and roads with easier grades and more pleasant surroundings.

James R. Dunn, ex-president of the League of American Wheelmen, thought that the railroads had begun to realize that good roads were profitable feeders of their lines and favored them.

Short addresses on good roads and the best methods of obtaining and maintaining them were made by A. B. Dunning, Scranton, Pa.; J. W. McCaller, Atlanta, Ga.; Prof. W. R. Hoag, Minneapolis, Minn.; W. H. Moore, president Good Roads Improvement Association of Missouri; G. W. Shields, Hannibal, Mo.; W. M. Hays, Minnesota; E. G. Harrison, New Jersey. The parliament adopted resolutions as follows:

1. That the parliament approve of the good work of the department of agriculture in furnishing information relative to good road work.
2. That each state agricultural college furnish a course on good road construction.
3. That the state legislatures be asked to appropriate funds to aid counties in building samples of good roads.
4. That congress be asked to make the good road inquiry department a permanent division of the department of agriculture.
5. Recommend that directors of farmers' institutes take up the subject of good roads as a part of their work, and that the United States department of agriculture furnish lectures on good road building.
6. All able-bodied men in prisons be kept at work on road material and not be allowed to come in competition with honest laborers.
7. That construction of good roads by country districts be encouraged.
8. That the efforts of the office of Road Inquiry and the League of American Wheelmen be heartily approved.
9. That all states create a non-partisan highway commission, to be separate from all other boards, which shall have supervision of all public affairs.

### An Experiment in Paving at San Francisco.

Mayor Phelan of San Francisco is having constructed in front of his building at Market-st. and Grant-ave. an experimental piece of paving 303 feet in length and extending from the curbing to the cable track. The pavement is of redwood block on Portland cement concrete foundation. The blocks are 6 in. square, are boiled in asphalt free from paraffine compounds, and will be laid with the grain of the wood perpendicular to the foundation; all joints will be filled with a mixture of asphaltic cement free from water, the whole to be covered with powdered limestone heated to 350 degrees Fahrenheit; the surface of the blocks will be covered with clear, hot sand and will be uniform in appearance with the contiguous pavement. The pavement is laid exactly as wood block pavements are laid in New York, London and Paris. The action of the supervisors in excluding wood, asphalt, brick and other modern pavements from the city

specifications led Mayor Phelan to make a test of this pavement on a long street. He considers the bitumen pavement being laid on Market-st. the best piece of work done recently in the city, and decided that by laying the wood block pavement the public would have an object lesson in the comparative merits of the pavements before them. The city has agreed to accept the pavement if it proves satisfactory.

### Road-Making Material in Porto Rico.

According to General Roy Stone road building is easy and inexpensive in Porto Rico. A goat-path hugging the steep hills lying between Adjuntas and Utuado, ten miles apart, was converted in six days into a road fit for army wagons. An abundance of rotten granite is found in this section, which yields readily to the pick and shovel and forms an excellent road material. Gen. Stone estimates that roads could be built almost anywhere in the island for from $750 to $1,000 per mile with native labor, which is satisfied with 20 cents per day in American money.

### Plans for Subways in Large Cities.

The Cosmopolitan Magazine offers a prize of $250 for the best essay on the economic arrangement and construction of subways, for carrying the sewers, water, gas, etc., in great cities.

### Illegal Award of Bridge Contracts.

Judge Payne granted an injunction Oct. 10 restraining the sanitary board from carrying out the contract for the eight-track drawbridge which is to cross the Chicago drainage canal near Campbell-ave., in Chicago. The contract was awarded to the Scherzer Rolling Lift Bridge Co., although two minority reports were presented in favor of the Strobel & Schinke designs. C. L.Strobel was the lowest responsible bidder at $690,000, but his bid was on a new design, and provided for a center pier 8 feet wide, with two waterways 80 feet wide. The engineers of the interested railways estimated its ultimate cost at $1,069,393 instead of $690,000, while the chief engineer of the sanitary district estimated the ultimate cost of the Scherzer bridge to the district, including a capitalization for payment to the railways of the cost of operation, maintenance, repairs and depreciation, would be about $915,000. Judge Payne based his opinion mainly upon the methods adopted by the district in inviting bids, as follows: (1) The trustees should have selected one of the designs in the first place; (2) that there must be a basis for all the bids; (3) that unless the design was selected in advance the terms and conditions were necessarily incomplete. On these grounds the court held that the award of the contract was invalid.

### Officers of American Society of Civil Engineers.

The officers of the American Society of Civil Engineers for the coming year have been named by the nominating committee, and will be voted on Jan. 18, 1899. The nominees are: For president, Mr. Desmond FitzGerald, Boston, Mass.; vice-presidents, Mr. Robert Cartwright, Rochester, N. Y., and Mr. Robert Moore, St. Louis, Mo.; treasurer, Mr. John Thomson, New York City; directors, Messrs. John A. Bensel, C. W. Buchholz and Samuel Whinery, New York City; Mr. Edmund K. Turner, Boston, Mass.; Prof. Palmer C. Ricketts, Troy, N. Y., and Mr. James D. Schuyler, Los Angeles, Cal.

### Asphalt Paving in New York City.

A somewhat sensational political controversy has been in progress in New York City during the closing weeks of the campaign over asphalt paving. The Tammany administration has attacked the work done under the reform regime of Mayor Strong, and charges that exorbitant prices were paid, insinuating that this was through some collusion, an investigation of which has been authorized with an appropriation of $150,000 for expenses. It is charged that the prices paid under the preceding administration were about $1 a square yard higher than in other cities. The prices paid under Mayor Strong's rule ranged from $2.53 to $3.10 per square yard. This, however, was based on a guaranty of the pavement for fifteen years, with the provision that the city should retain 30 per cent. of the contract price for five years, and then pay it in ten annual installments. In answer to the attack of the Tammany administration, it is stated that under Mayor Strong there were lower prices and more competition on asphalt paving than under his predecessors.

A fair comparison cannot be made between New York and other cities without taking into consideration the conditions affecting the work. It costs more to do work in New York than in other cities. Larger and more plants are required to reach all parts of the city. The officials there have required rapid work, much of which the contractors were compelled to do at night. The price for maintenance is necessarily affected by the long term of the guaranty, and the very heavy traffic, and the retention of nearly

one-third of the price for most of the fifteen years must be taken into account, as the contractor could thus figure on getting only about $2 a square yard for the immediate work, which is about the price paid in other cities where the guarantee is for a short period. Still other considerations to be taken into account in New York as exceptional in comparison with smaller cities are the higher taxes on higher valuation of plants; the higher rents; higher prices of labor, and sometimes for shorter hours; the removal of excavated earth, much of which must be carried out to sea in scows; the long haul of paving materials, where the asphalt plants are often several miles from the place where the pavement is to be laid, and the heavy ferriage expense from plants across the river, amounting to from $40 to $60 daily. A detail of these differences is suggested by the Engineering News, which, in pointing out the unfairness of comparison between New York and other cities without taking into account all considerations, says: "To compare the $3.10, therefore, with work done in other cities with a shorter time-repair guarantee or no guarantee at all, and with light street traffic compared with New York, is evidently unfair. In New York other conditions also call for a relative higher price per yard. The grading of the street requires the removal of from 12 to 18 inches in depth of soil, and to get rid of this dirt costs from 50 to 60 cents for every square yard of asphalt laid. In other cities this cost may range from 8 to 15 cents." To those who know what paving should reasonably cost the New York prices will not be so questionable as the appropriation of the enormous sum of $150,000 for an investigation inaugurated on the eve of an election.

Gen. C. H. T. Collis, commissioner of public work under Mayor Strong and the reform citizens' administration of New York, which directed the city affairs between the last and the present administration of Tammany hall, furnishes the following statement regarding the charges affecting his department: "During Mayor Strong's administration about twenty millions of dollars were spent by the public works department. If the charge is true that the price paid for asphalt is too high what shall be said about its cost before Mayor Strong came into office, when prices were 30 per cent. higher? To compare our prices with those paid by other cities is the merest nonsense. Unless the traffic is exactly similar and the guaranty of maintenance is for precisely the same term of years, no comparison can be made. For instance, Fifth-ave., over which 18,000 vehicles pass daily, cost nearly $5 a square yard, while One Hundred and Twenty-sixth-st., over which perhaps less than 500 pass, cost only $2.53 for exactly the same pavement. When asphalt was first introduced into this city competition was opened to all the world. Tammany hall, however, restricted bids to particular brands of asphalt, which enabled the contractors who owned these deposits to make their own prices, and this was the condition of affairs when Mr. Brookfield and I came into office. We at once called together all the people who were willing to compete on fair terms, and this meeting resulted in such a modification of the specifications as produced honest rivalry and low prices. Tammany hall paved the west side of the Boulevard from Ninety-second to One Hundred and Eighth-st., in 1893, at a cost of $3.85 per square yard. I paved the east side of the avenue, from Ninety-second to One Hundred and Sixth-st., in 1896, at a cost of $2.98 per square yard."

# MACHINERY AND TRADE.

### Mineral Rubber Coating for Water Pipes and Reservoir Lining.

An eight-page circular has been published by the Assyrian Asphalt company of Chicago on the subject of the material which they supply for the coating of water pipes, conduits, fence posts, etc., and for lining water reservoirs. The material is known as mineral rubber asphalt, and testimony is set forth as to tests and satisfactory uses of it. Consideration was given at length in the last annual report of City Engineer Cappelen of Minneapolis, who used it largely in the new reservoir pipe lines for the water supply system of that city. He strongly indorses it and in Minneapolis specifications it was made the standard as a pipe-coating material. His report of tests of it shows results as follows:

| Test. | Temp. of Pipe. Deg. F. | Temp of Coating. Deg. F. |
|---|---|---|
| No. 1 ..... ..... | 400 | 400 |
| No. 2 ..... ..... | 400 | 400 |
| No. 3 ..... | 300 | 300 |
| No. 4 ..... .... | 300 | 300 |

Pipe Dipped.
Twice, then put in ice water
Once, then " "
Twice, then " "
Once, not " "

He adds: "Coating covered pipe splendidly in all cases and somewhat thicker for the 300 degrees temperature and stood hammer test perfectly. The material is so elastic that, by cutting into the coating and entirely removing some of it, the opening can be covered by simply hammering the edges around the space so that it is impossible to see the point. The coating did not foam even up to a temperature of 700 degrees F."

Mr. Cappelen further says that the coating was not affected by the muriatic, nitric and sulphuric acid tests, and he is responsible for the statement that "it is probably the best coating ever put on the market, not barring the so-called Sabin japanning process."

The manufacturers say that it is made "from asphalts and mineral rubber from their mines in Utah, is refined to 99.9 per cent. pure, is unaffected by acids, earth salts, water, electrolysis, earth currents, frost or heat, or any conditions to which it is likely to be subjected; is ductile at a greater range of temperature than any other material known to science, hence will not crack or peel off, or run in the hottest sun; is a perfect insulator. Being impervious to water, acids, etc., without brittleness, it follows as a matter of course that it is the perfect protector of metals against rust, etc. It is easily and cheaply applied, without waste, as there is absolutely no sediment of earthy matter so common in all other coatings. The old process of coating pipes with coal tar products, while making them look bright in transit, is attended by great danger, because the process of disintegration of the metal sets in when there is no opportunity of inspecting or remedying the evil, and has no other advantage except cheapness, and it is a well known fact that the coal tar pitch used today is of a much inferior grade to that used ten to fifteen years ago, due to the difference in the process of gas making, the increased temperature used causing destructive distillation, and cracking up the hydro-carbon into a new and worthless series. So much care is necessarily observed by engineers in the selection of the pipes themselves that the kind of coating for their preservation should be likewise carefully selected, and a coating not used merely on account of cheapness alone. To the cost of such cheap coating—if it does not prevent pipes rusting or being affected by water, acids, electrolysis, etc.—should be added the cost of the pipes which are thus rendered useless, making it, in the end, the most expensive coating. Our coating fills all requirements, and as a result has been most extensively used. Its present high standard will always be maintained."

The following is recommended by the company as the best method of applying the coating to pipes: "Having the proper vertical dipping tank, bring the pipes to a temperature of 350 degrees to 400 degrees F., either by internal gas jet, or other flame, or by heating them in an oven, then dipping them into the dipping tank, thoroughly immersing and leaving pipe in dip until it has acquired the same temperature as dip. Then slowly withdraw the pipe (about 25 to 30 feet per minute) so that the surplus material may be drawn off by capillary attraction of the dip itself, thus preventing unequal accumulation at different points of pipe, and making a smooth coating all over. When the pipe has been raised out of the dip, it should be left to drain a few minutes, the thickness being tested by measuring and if it is found to be less than 1-64 of an inch, or if, in consequence of air bubbles or moisture in the dip, it shows any effect of foaming or pin bubbles, the pipe should be immersed again quickly, and withdrawn slowly, so as to accumulate at least 1-64 of an inch of the dip on the pipe, but 1-32 of an inch is still better. It is then allowed to cool before laying down." It is claimed that dipping pipes vertically can be accomplished much more expeditiously than dipping horizontally, and there is further advantage in getting a more even distribution of the material. A tank is made specially for this method of dipping and has been adopted by several manufacturers.

Information is also given as to the use of the material in field work, when pipes are taken to the location where they are to be laid, riveted together and tested. For the purpose of covering the rivets and joint work, or in places where the dip has been damaged in transit, a special field pipe-coating is furnished, made as a thick paint, air-drying. The manufacturers say regarding this: "Should this special field coating become too thick to use, it may be thinned by stirring in sufficient turps to make it easily workable, care being taken not to thin it too much, as it is essential that a coating of not less than 1-64 of an inch be applied on these joints, both inside and out. This special coating containing turps, makes it necessary for care to be exercised in the pipe so as not to have an unprotected light within fifteen to twenty feet from the work, unless there is a current of air passing through the pipe, then keep the light to windward. When pipe is all tested, it should be thoroughly inspected to see that there are no thin or bare spots from which the

coating has been accidentally, or otherwise, removed; this field coating should be applied both inside and outside of the pipe, to repair all such defects. If this is carefully done before back filling, and the back filling carefully done to prevent damage to the coating, this pipe will remain protected for an indefinite period."

The Assyrian company also makes strong claims for its reservoir lining material, which it calls mineral rubber asphalt reservoir cement. It is stated that it may be used alone or mixed with pure silica sand. It is claimed for it that it is 99.9 per cent. bitumen. The directions given for its use are as follows: "See that surface is dry and clean, and, if concrete, leave with rough cement finish. For two-coat work, the first coat should be thinned down by adding about 25 per cent. of our No. 1040 maltha flux, applied at about 300 degrees F., with mops or brushes, similar to mopping roofing pitch. The second coat to be applied at about 325 degrees F., without any fluxing, in the same manner as the first coat, care being taken at all times to have the mopping done evenly, so as to leave no pin holes or air holes. If hot iron is used for smoothing the surface, it must not be above 400 degrees temperature."

### Proposed Combination of Paving Brick Manufacturers.

Associated press reports, under date of October 27, state that William G. Hipp, of Massillon, who has been a prime mover in the organization of the brick trust, says that it will be a combination of paving brick and not fire-brick manufacturers, as previously reported. He says that he has arranged in New York for $15,000,000 needed to finance the plan. Other reports attribute to the movement almost incredible magnitude, as, for instance, a telegram from Zanesville, O., states that the organization will embrace all the factories making modern clay-working machinery, thus shutting off independent concerns from equipping themselves with machinery that would make competition possible. Mr. Hipp is credited with saying that there is no intention of increasing prices, but the purpose is to prevent their being cut. Authoritative information cannot be obtained regarding the project at this time.

### Information About Water Works Appliances.

A handsome new catalogue has been issued by the Coldwell-Wilcox company of Newburg, N. Y., illustrating and describing their gate valves, sluice gates, expansion and flexible joints, cast iron flanged pipe and fittings for high pressure, water catchers, separators, screens and special appliances for water works, manhole covers and frames, etc. In addition to information as to improvements in these various appliances, and explanation as to their special merits, the catalogue contains matter of interest to water works people. Those who wish to keep themselves well equipped for emergencies and for consideration of such matters will find it desirable to have it at hand. Copies can be obtained gratis by addressing the Coldwell-Wilcox company, Newburg, N. Y.

### Spiral Riveted Pipe for Water Works Construction.

The great strength and long life of Root's spiral riveted water pipe, the ease with which it may be handled, and the fact that it is not liable to give trouble through leakages, make it especially desirable, the manufacturers claim, for water works construction. The Abendroth & Root Manufacturing company, 28 Cliff-st., New York, the sole manufacturers of the pipe, report a number of large orders recently received for this particular service. To the Sheely & O'Shee company, contractors, of Lincoln, Neb., they have lately shipped 12,000 ft. of spiral riveted pipe which will be used in extending the water works at Lanesboro, Minn. About 10,000 ft. have been sent to Milledgeville, Ill., and 15,000 ft. to the city of Augusta, Wis. The U. S. Water and Steam Supply company, contractors, Kansas City, have placed an order for about 5,000 ft. of pipe which will be used at Concordia, Mo., and 6,500 ft. are to go to J. L. White, contractor, Wyoming, Ill.

### The Cement Plant of the Illinois Steel Company.

The Illinois Steel company has issued a handsome illustrated pamphlet descriptive of its various plants, their capacity and methods of operation, which is of much interest. The vast operations of the company are suggested by the descriptions, but they are so modest in statement that the ordinary reader will not grasp their immensity. In connection with the oldest and smallest plant of the company, the North Works, a cement plant has been established. Here there are two blast furnaces for the production of pig iron. The ore limestone and other materials used in these furnaces are specially selected with reference to the composition of the resulting slag, so that in addition to the iron a valuable cement product is obtained. A description of the process is given in the pamphlet showing why the cement made

here is so much more valuable than the ordinary slag cements, and giving the reader the impression that careful inspection of processes and analysis of materials and product should insure uniformly good cement.

### The Jeffrey Columbian Separator for Cement Manufacturers.

An attractive little pamphlet has been issued by the Jeffrey Mfg. Co. of Columbus, O., describing the Jeffrey Columbian separator, screen and bolter for the manufacture of cement. Many points of superiority are claimed for it, among which are the following:

"It has the greatest capacity per square feet of cloth; the meshes in the cloth never clog or close up; the cloth wears from four to six times as long as any other of the same capacity; different grades of fineness can be bolted without changing cloth; it takes less power than any other; the cloth can be 20 to 40 meshes coarser than fineness of product required; it requires less space in mill for same capacity; two to three grades of fineness can be made on same machine at the same time and in same space; it has less wearing parts than any other; its wearing parts are easily, quickly and cheaply replaced; its wearing parts are adjustable; its adjustments are simple and positive; it requires the lesat attention; the first cost is less than any other of the same capacity; it is not likely to get out of order; it is dustless; it requires no knockers, blowers or brushes to keep cloth open and clean; it requires less cloth for same capacity; its bolted product is more uniform; the separations are perfect; it has no unbalanced weight or motion; its feeding arrangement is simple and durable."

Testimonials are published from a number of cement manufacturers, including the Lawrence Cement company, the Empire Portland Cement company, the Hercules Cement company, the New Jersey Portland Cement company, the Cumberland Hydraulic Cement company and others.

### Trade Notes.

The asphalt works at South Amboy, N. J., were destroyed by fire Sept. 30.

The location of a paving brick plant at Steele City, Neb., is said to be contemplated.

The Patton Brick & Tile company, whose plant at Rochelle, Ill., was destroyed by fire recently, will rebuild.

Fire in the warehouse of the Butte Sewer Pipe and Tile company, Butte, Mont., Oct. 12, caused a loss of about $1,000.

The Vicksburg Sewer company, limited, has been incorporated to build and operate a public sewer in Vicksburg, Mich.

The Blue Rock Cement company, New Albany, Ind., has been organized by capitalists of New Albany and Jeffersonville.

The Dickinson Cement company, Chicago, Ill., will, according to press reports, build a new plant at Deer Park, near LaSalle, Ill.

Plans are being prepared for a number of fire-proof mill buildings and stock houses for a new plant for the Lawrence Cement company at Siegfried, Pa.

The Portland Cement company of Utah, Salt Lake City, has leased land near Bedford, Ind., on which a plant will be erected at a cost of about $125,000.

The Clinton Iron & Steel company, Pittsburg, Pa., is erecting a plant for the manufacture of Portland cement from furnace slag, adjoining their furnace.

The Barber Asphalt Paving company has erected an asphalt plant at Lincoln, Neb., where it secured a contract recently for paving Eleventh-st. with asphalt.

The Baltimore Filter company, Baltimore, Md., has been incorporated by Robert M. Spedden, Robert H. Smith, Joseph E. Henderson, Lucien B. Carpenter and Z. Franklin Potter.

The General Asphalt company, or La Compagnie Des Asphaltes De France, Ltd., has opened an office at 204 Carondelet-st., New Orleans, La. Alfred F. Harley, consulting engineer, is in charge.

The works of the Catskill Shale Brick and Paving company, Catskill, N. Y., have been sold, under a judgment of foreclosure, to Howard P. Ellis for $300,000. The sale will not interfere with the operation of the plant.

A company has been organized at Greenville, Pa., to manufacture paving brick, according to press reports. The plant will be located at Conneaut, O. A. O. Benjamin of Greenville is said to be interested in the project.

A decision has been rendered in favor of F. E. Hetherington of Indianapolis, Ind., who owns the patents for a railway asphalt plant, contention for which has existed in the patent department of the government for more than a year.

A stock company will be formed at Morrice, Mich., by F. E. Purdy, A. L. Beard, B. F. Rann, Sam Crouch and W. J. Richardson to erect a cement factory. An excellent quality of marl and clay suitable for that purpose has been found, it is claimed.

The cement works of the Coldwater Portland Cement company, Coldwater, Mich., are being rapidly erected. The Michigan Portland Cement company secured options on the controlling interest of the Coldwater Cement company a short time ago and it will probably be merged into the larger organization.

The Eastern Paving Brick company has been incorporated in Columbus, O., for mining, quarrying, manufacturing and selling all kinds of brick and tile, sewer pipe and other clay products. The stockholders are R. McLaughlin, O. M. Stafford, P. Johnson, Jotham Potter and A. C. Dustin of Cleveland.

The Portland Cement company of Utah, at Salt Lake City, has replaced the cement plant which was destroyed by fire May 31 with a new one which began operation about Oct. 1. The officers of the company are: President, J. W. Lilienthal; vice-president, Jas. R. Moorman; secretary, Albert Raymond; general manager, Thos. C. Cairns.

Bids for furnishing a 28,000 pounds steam road roller were received Oct. 1, 1898, at Sheboygan, Wis., as follows: O. S. Kelly Co., Springfield, O., 28,000 pounds, $3,250; 30,000 pounds, $3,350; 33,000 pounds, $3,450; 35,000 pounds, $3,500; 37,000 pounds, $3,700. Russell & Co., Massillon, O., 28,000 pounds, $2,500. Optenberg & Sonnemann, Sheboygan, 28,000 pounds, $3,250 for steam steering gear, and $3,050 for hand steering gear. Buffalo Pitts Co., Buffalo, N. Y., 28,000 pounds, $3,300.

# IMPROVEMENT AND CONTRACTING NEWS.

## PAVING.

Chicago, Ill.—The cedar block pavements of this city were damaged by the recent rainstorms to the extent of about $250,000.

Buffalo, N. Y.—The recommendations of the finance committee, that paving warrants be drawn and delivered to the contractors, as heretofore, and that the bond exacted from them be increased to 50 per cent. of the contract price, has been adopted. The proposition applies to past as well as all future contracts.

Under "contracts awarded" in the October number of Municipal Engineering it was stated that Massillon brick would be used in the street paving contract at Ligonier, Ind. J. D. Andrews, secretary of the Trimble Brick Mfg. company, Trimble, O., writes that this is a mistake, as that company is shipping Trimble block to be used for that purpose.

Chicago, Ill.—The officers of the Sheridan Road association have beeen assured of the right-of-way for the drive through the village of Lake Bluff. The road is completed to the northern boundary of Lake Forest, which is also the southern limit of Lake Bluff. The drive through Lake Bluff will extend over two miles and will be the most beautiful part of the entire road.

Kansas City, Mo.—An injunction was granted against the Gilsonite Paving company, Oct. 12, restraining it from proceeding with paving Ord-st., from Lexington to Elma, with asphalt, until the grade has been established on the street. Figures compiled by M. E. Getchell, chief clerk in the office of City Engineer Wise, show that the contracts awarded for municipal improvements, consisting of asphalt and brick paving, curbing, grading, sidewalks and sewers, amount to $1,063,334.67.

Peoria, Ill.—Judge Shaw made permanent, Oct. 12, the temporary injunction granted recently in the Dechman asphalt paving contract. The injunction was granted on the ground that the board of local improvements had no right to let the contract for the paving until the assessment roll had been confirmed in the county court. The work will now be delayed until next year, as it will be necessary to advertise for new bids. The contract was awarded to the Assyrian Asphalt company at $1.54 a sq. yd.

New Orleans, La.—As soon as the supreme court has passed upon the new law, City Engineer Bell will have the sidewalks of this city put in good condition. Heretofore there has been no statute by which property-owners could be compelled to repair their sidewalks, bring them up to grade and keep them in order. The city engineer could call upon them to do so, but if they refused there was no punitive clause or law to make them repair them. Owing to some little uncertainty in the new law as to how the cost of paving should be prorated the matter has been carried to the supreme court in order to get a final ruling from that body.

### CONTEMPLATED WORK.

Bridgeport, O.—Brick or macadam paving is proposed.

Elkhart, Ind.—The street committee of the council discussed the question of paving Second-st. Oct. 14. Brick or asphalt is favored.

Oakland, Md.—The sum of $13,000 will be expended on street improvements.

Redland, Cal.—The city trustees have adopted specifications for asphalt street crossings.

Springfield, O.—Ordinances were passed Oct. 18 for grading and graveling about ten streets.

Oskaloosa, Ia.—The construction of about one and one-half miles of brick paving is contemplated for next year.

Moline, Ill.—An ordinance was passed Oct. 18 providing for the paving of Liberty-st.

Decorah, Ia.—About 1,000 lin. ft. of paving is contemplated for next year. T. F. Acechmoody, cy. clk.

Beardstown, Ill.—The city council decided Oct. 17 to have State-st., from Main-st. to the wagon bridge, paved.

Ottumwa, Ia.—A resolution was passed Oct. 10 to pave S. Green-st., from Main to Semantha. Mayor Phillips.

Leavenworth, Kas.—The question of repaving Delaware and Cherokee-sts. with asphalt is being agitated.

Petersburg, Va.—Sycamore-st. will be paved with brick or asphalt. N. T. Patterson, prest. com. coun.

Urbana, O.—The council contemplates the construction of brick sidewalks on Dugan and Kenton-sts.

Council Bluffs, Ia.—A resolution was passed by the city council, Oct. 10, to pave Fourth-st. with asphalt.

Elgin, Ill.——Brick paving is proposed for National-st., from the river to Villa-st. Alderman Anderson interested.

Sedalia, Mo.—A resolution has been passed to repave Seventh-st., from Ohio to Grand-ave. Jas. P. Quinn, cy. clk.

Middletown, Conn.—The common council passed a resolution Oct. 3 authorizing the macadamizing of Warwick-st.

Boston, Mass.—The board of street commissioners voted Oct. 12 to widen Charlestown-st., from Haymarket-sq. to Causeway-st.

Shippenburg, Pa.—The council is said to be considering the question of issuing $10,000 bonds for street improvements.

Marengo, Ill.—The business men are agitating the question of paving State-st., from Main to the Northwestern tracks.

St. Louis, Mo.—The business men have petitioned for asphalt strips to be laid over the granite pavements of two streets.

Plainfield, N. J.—The estimated cost of paving Park-ave., Somerset-st. and Watchung-ave. with asphalt is $24,395.

Albany, N. Y.—Plans are being prepared for paving Elizabeth, Hamilton, Rose and Dove-sts. in 1899. Horace Andrews, cy engr.

Houston, Tex.—City Engineer Miller has surveyed Main-st., from Buffalo bayou to McKinley-ave., preparatory to repaving with asphalt.

Greensburg, Pa.—A resolution has been passed to pave Pennsylvania-st., from W. Pittsburg to Second-st., with brick. Ira C. Snider, cy. clk.

San Antonio, Tex.—The business men are in favor of the construction of an asphalt driveway to Fort Sam Houston. Mayor Callaghan.

Pennington, N. J.—Plans and specification have been adopted for macadamizing the road between this place and Trenton, a distance of seven miles.

Janesville, Wis.—An ordinance has been introduced by Alderman Carpenter requiring that sidewalks be built of plank, cement, asphalt or brick.

Washington, Pa.—This borough has voted to increase the bonded indebtedness $60,000 for paving to be done next year. Geo. D. Jenkins, boro engr.

Marinette, Wis.—Paving is contemplated for Riverside-ave. The property-owners on the street are undecided regarding the choice of material for the street.

Beaumont, Tex.—Aldermen Kelly, Ives and Millard have been appointed a committee to secure plans and specifications for different kinds of paving. D. P. Wheat, mayor.

The question of issuing bonds for street paving and improvements will be voted on as follows: Mauchchunk, Pa., $40,000; Baltimore, Md., $1,500,000; Bridgeport, O., $75,000; Monroe, La.; York, Pa., $50,000; Hanover, Pa., $50,000.

Peoria, Ill.—An ordinance was adopted Oct. 4 for the construction of the asphalt paving in Park-ave., from its present terminus to the entrance of Glen Oak park.

St. Joseph, Mo.—A petition has been presented to the mayor and council for asphalt paving on Seventh-st., from Robidoux to Oliver-st., with the exception of one block between Felix and Edmund-st.

St. Louis, Mo.—The council committee on public improvements passed eight street improvement bills Oct. 18. Bills were passed Oct. 11, also, for the reconstruction of streets, with granite blocks, involving an expenditure of $201,000.

Peoria, Ill.—The board of public works directed the city engineer Oct. 17 to submit estimates for brick paving on S. Madison-ave., from Fulton to Franklin-sts., and S. Elizabeth-st., from High to Main.

Baltimore, Md.—Appropriations have been asked for street paving as follows: Asphalt, Gough-st., from Broadway to Patterson Park-ave., $37,000; Pine-st., from Lexington to Saratoga, $2,200; Bush-st., from James to water front, $20,000.

Toledo, O.—The viewers have reported favorably on the proposed stone road to connect Maumee, Waterville and Whitehouse, at a cost of about $80,000, and the question will be considered soon by the county commissioners. The road will be 18 miles long.

Omaha, Neb.—Ordinances were read the second time Oct. 15 for paving with asphalt Twenty-second-st., from Leavenworth to Mason; Twenty-fourth-ave., from Harney-st. to St. Mary's-ave.; Thirty-second-st., from Dodge to Davenport; Fortieth-st., from Farnam to Jackson.

Chicago, Ill.—The property-owners on Halsted-st., between Van Buren and Twenty-third, are undecided as to what material they desire for paving, brick or granite. They have petitioned the board of local improvements to defer the matter a month so that a petition can be circulated.

Anderson, Ind.—The preparation of an ordinance, requiring gas mains to be laid on each side of streets to be paved, was authorized Oct. 17. The "News" states that "the object is to prevent cuttitng into pavements to make connections or repairs and indicates that asphalt paving is coming."

Norfolk, Va.—W. T. Brooke, city engr., has prepared paving estimates, as follows: Brambleton-ave., 19,000 sq. yds., Belgian block, $32,800, and brick, $36,100; Park-ave., 13,600 sq. yds., Belgian blocks, $23,120, and brick $25,840. Messrs. Ferrebee, Gale and Sterling have been appointed a committee to consider the question of issuing $20,000.

New Britain, Conn.—The paving of Main-st. with asphalt block will probably be deferred until next spring. A doubt exists as to whether the city has the power to compel the adjoining property-owners to pay their proportionate share of the paving and the street committee believes it is better to wait until such power can be obtained from the general assembly rather than run the risk of suit.

Indianapolis, Ind.—Resolutions were adopted Oct. 25 for a brick roadway on Bird-st., from New York to Vermont, and cement walks on Thirtieth-st., from Meridian-st. to Capitol-ave. Engineers' plans were ordered for brick roadways, graveling and cement walks in certain streets and alleys. Final action was taken Oct. 26 for constructing cement walks in certain streets and a petition filed for asphalt or wooden block paving in Arch-st., from Broadway to Park-ave.

Chicago, Ill.—The property-owners on Washington boulevard, between W. Forty-sixth and W. Fifty-second-aves., have petitioned for the paving of that section of the thoroughfare. L. E. McGann, commissioner of public works, completed a list of streets in South Town, and parts of Seventh, Eighth, Ninth and Tenth wards, which, in his opinion, need to be paved or repaved at once. The agitation for the completion of Washington boulevard from its present terminus in the town of Harlem through Melrose park is being revived.

### CONTRACTS TO BE LET.

Dell Rapids, S. D.—Bids will be received until Nov. 5 for building sidewalks. D. E. Ward, cy. audt.

Cohoes, N. Y.—Bids are asked until Nov. 9 for grading and paving S. Saratoga-st. Pub. Imp. Com'n.

Lawrenceburg, Ky.—Bids will be received until Nov. 7 for brick paving. J. W. Waterfill, clk. cy. coun.

Toledo, O.—Sealed proposals will be received until Nov. 7 for paving Eastern-ave. with vitrified paving blocks. Lem P. Harris, cy. clk.

Pittsburg, Pa.—Bids are asked until Nov. 3 for improving Freeport, Crooked Run and Street's Run roads in Allegheny county. F. W. Patterson, co. engr.

New York City—Sealed proposals will be received until Nov. 3 for the construction of roads, walks, etc., at Fort Hancock, N. J. G. G. Barley, Capt. A. Q. M. U. S. V., Army Bldg., New York.

Cincinnati, O.—Sealed proposals will be received until Nov. 3 for the construction and repairing of all artificial sidewalks in the eastern and western districts for one year. A. B. Ratterman, prest. bd. cy. affairs.

South Bend, Ind.—Sealed proposals will be received until Nov. 14 for curbing with cement California-ave., from Leland to Portage-ave., and until Nov. 28 for paving and curbing with cement Clinton-st., from Sample to South. L. A. Hall, cy. clk.

### CONTRACTS AWARDED.

Boston, Mass.—The contract for macadamizing N. Howard-st. was awarded to Geo. H. Wentworth & Co., for $7,240.

Oshkosh, Wis.—The contract for curbing Thirteenth-st. was awarded to Lutz Bros.

New Haven, Conn.—John A. Doolittle & Co. was awarded the contract for hardening Arch-st. at 28 cts. a sq. yd.

Beloit, Wis.—The contract for brick paving was awarded to A. R. Rutledge & Co. of Rockford, Ill., for $15,000.

Bloomington, Ill.—The Bermudez Asphalt Paving company has been awarded the contract for paving a portion of Center-st.

Akron, O.—The contract for paving Bittman-st., from Maple to Crosby, with brick, has been awarded to P. T. McCourt & Co.

Butte, Mont.—The contract for paving Broadway alley with granite was awarded to E. O. Dugan & Co. at $4.25 a sq. yd.

Philadelphia, Pa.—Richardson & Ross secured the contract, Oct. 17, for 726 sq. yds. of asphalt paving at $1.19 a sq. yd.

Deerfield, N. Y.—The contract for improving 2½ mis. of the River road has been awarded to Jas. J. Dwyer, Utica, for $13,806.

Greencastle, Ind.—A contract for macadamizing, in Warren twp., has been awarded to O'Brien & Co. of Cloverdale, Ind., for $11,500.

Toronto, Ont.—The contract for asphalt paving on Queen and Niagara-sts. has been awarded to the Construction and Paving company for $15,036.

Council Bluffs, Ia.—The contract for 16,000 sq. yds. of brick paving has been awarded to E. A. Wickham & Co. at $1.098 a sq. yd. for Council Bluffs brick.

Salamanca, N. Y.—Shea & McGann, Dunkirk, N. Y., have been awarded the contract for about 9,755 sq. yds. of brick paving in this city for $15,000.

Cincinnati, O.—The contract for paving Delhi-ave., 6,900 sq. yds., with granite, was awarded, Oct. 5, to Wm. Fogarty at $3.35 a sq. yd., or $23,822.

Western Springs, Ill.—The contract for constructing ¾ mis. of 5-ft. cement sidewalk was awarded, Oct. 5, to Spikes & Salfisberg of Aurora, Ill.

Lansingburgh, N. Y.—The contract for constructing about 50,854 sq. yds. of macadam paving has been awarded to Thos. H. Kane, Troy, N. Y., for about $64,000.

Quincy, Ill.—The contract for paving Second-st., from Broadway to Vine, was awarded to Henry Rees at 84 cents a square yard, using Galesburg repressed brick.

Monroe, La.—The Talbot Paving company, Detroit, Mich., has, according to press reports, been awarded the contract for paving Desiard-st., from the river to Sixth-st.

Yardley, Pa.—The Delaware Quarry and Construction company of Lambertville, N. J., was awarded the contract for 7,000 square yards of macadam paving on the main street for $5,475.

Oswego, N. Y.—The board of public works entered into a contract Oct. 17 with the Warren-Scharf Asphalt Paving company to pave the intersection at Bridge and E. First-sts.

Erie, Pa.—The contract for paving Seventeenth-st., from State to Peach, with brick was awarded Oct. 10 to John McCormick & Son at $1.72 a sq. yd. for Mack No. 1 brick.

Detroit, Mich.—The board of public works recommended, Oct. 10, that a contract be entered into with Henry Merdian for Trimble block, for paving Second-st., from Front-st. to Lafayette-ave.

LaCrosse, Wis.—N. C. Bacheller & Co. secured the contracts Oct. 10, for curbing and gutters on several streets at 24 cts. a lin. ft. for gutters and 29 cts. a lin. foot for curbing.

Toledo, O.—The lowest bids received Oct. 10 for paving streets were as follows: Oak-st., brick, H. J. Jameson, $1.47 a sq. yd.; Scott-st., brick, Geo. H. Cole, $1.44; Sixth-st, brick, H. P. Streicher, $1.34.

Auburn, N. Y.—The Warren-Scharf Asphalt Paving company, New York City, has the contract for laying a sample piece of asphalt pavement over Medina stone pavement. The work consists of 1,015 sq. yds. at a cost of $1,750.

Boston, Mass.—Road improvement contracts were awarded Oct. 13 as follows: Road in Merriman, M. Cashman, Newburyport, Mass., $2,474.59; Chelmsford, C. H. Kelleher, Newburyport, $7,172.54; North Reading, C. H. Kelleher, $3,587.28.

Hamilton, O.—The contract for grading and graveling Market-st., from Fourth to Water, was awarded Oct. 18 to W. H. Louthan for $7,558.86. The contract for the main conduit was awarded to Jos. T. Guillaume for $15,745.10.

Cleveland, O.—M. F. Bramley secured the contract for repairing three streets for $15,641 and for the improvement of Ridge road for $6,353, and the Trinidad Asphalt Paving company the contract for asphalt paving on Pearl-st. for $28,108.

Janesville, Wis.—The contract for macadamizing a portion of S. High and Dodge-sts. was awarded Oct. 14 to J. H. Watson at 29¼ cts. per sup. yd. for macadamizing, 11 cts. for furnishing and setting wood curbing and 7 cts. for setting stone curbing.

Syracuse, N. Y.—The Columbia Construction company was awarded the contract Oct. 10 for paving N. Salina and Fulton-sts. with asphalt for $29,014.70. Bids were received for paving McBride-st., from James to Ash., with asphalt and sandstone blocks, but the awarding of the contract was postponed for a week.

St. Paul, Minn.—The board of public works awarded, Oct. 18, the contract for boulevarding Dewey and Feronia-aves., to Fielding & Shepley, for $2,950. John W. Fleetham secured, Oct. 10, the contract for macadamizing certain portions of Rice-st. and the White Bear road, for $16,985.

Kansas City, Mo.—The contract for paving Penn-st., from Sixtieth to Twentieth, which was given to the Parker-Washington company recently, has been rescinded and given to the Barber Asphalt Paving company. The contract involves the laying of about 9,000 sq. yds. of asphalt at a cost of about $12,000.

Rochester, N. Y.—The contract for the Glenwood Park asphalt improvement was awarded to the Rock Asphalt company for $10,037.20; Olean-st., cement walks, E. Q. Oliver, $990; Hebard-st., cement walks, Jacob Mathis & Son, $490; Pierpont-ave., cement walks, Jacob Mathis & Son, $1,660.

Cleveland, O.—Bids were received by the Park Board, Oct. 14, for constructing the main drive through Wade Park as follows: Northern Ohio Paving and Construction company, $28,259; Blanan & Baisch, $29,498; M. I. DeCelle, $29,626; Spence Bros., $30,749; John E. O'Brien, $32,121; Condon & Blasberg, $32,334; William Wachs, $34,957.

Omaha, Neb.—Bids were received, Oct. 7, for asphalt, brick or stone paving, as fol-

lows: Barber Asphalt Paving company, New York City, $2.05 a sq. yd., 5-yr guaranty; J. B. Smith, Omaha, $1.87, 5-yrs; Hugh Murphy, Omaha, $1.69, 5-yrs; curbing, 69c a lin. ft.; brick, $2.20; Colorado sandstone, $1.80; John Grant Paving company, Omaha, $1.69, 5-yrs.; curbing 70 cts.; P. H. Mahoney, Washington, D. C., curbing, 58 cts.

Indianapolis, Ind.—The Indiana Bermudez Asphalt company was awarded a contract, Oct. 25, for asphalt paving on Fourteenth-st., from Meridian to Illinois, at $2.90 a lin. ft. Contracts were awarded, Oct. 10, as follows: Paving alley, brick, Capital Paving and Construction company, 99 cts.; creosoted wooden blocks, alley, Capital Paving and Construction company, $2.06; creosoted wooden blocks, Ogden-st., Daniel Foley, $4.14.

Logansport, Ind.—Bids were received Oct. 17 for asphalt paving as follows: Bermudez Paving company, Indianapolis, asphalt, $8,384.36; brick gutters, $944.45; combination curb, $871.80. Warren-Scharf Asphalt Paving company, New York City, asphalt, $9,678; brk. gutters, $1,604; c. c., $1,214. Assyrian Asphalt company, Chicago, asphalt, $9,268; brk. gut., $929.22; c. c., $632. Lux & Talbott, Logansport, asphalt, $8,066; brk. gut., $1,016.20; c. c., $800.

Atlantic City, N. J.—The contract for paving Pacific-ave., from Vermont to Albany-aves., was awarded Oct. 3 to the Delaware River Quarry & Construction company of Lambertville, N. J., as follows: Macadam roadway, 62 cts. a sq. yd.; block pavement, $1.75 a sq. yd.; concrete, $4.50 a cu. yd.; straight curbing, 38 cts. a lin. ft.; curved curbing, 5 cts. a lin. ft.; total, $56,963.39. The bid of this company was the lowest of eleven bidders.

New Orleans, La.—Belden & Seely was awarded the contract Oct. 10 for paving Canal-st. with asphalt at $2.10 a sq. yd. and $4.25 a cu. yd. for concrete; paving Canal neutral ground with brick, $2.50; total, $138,-101.25. Bids were received for this work Aug. 8, but were rejected, and new bids asked, which resulted in a saving to the city of $93,812.75. The only bid submitted for the paving of the neutral ground on Canal with bricks was that of Belden & Seely, but it is not probable that it will be accepted.

Louisville, Ky.—Bids were received recently for paving with asphalt Chestnut-st., from Thirty-first to Western Park, E. Broadway, from Highland to Transit and Von Borries and Hepburn-aves. The lowest bid considered was that of the Barber Asphalt company, $22.70 per sq. ft. with a 5-yr. guarantee. The Breckenridge company bid $15 with a 5-yr. guarantee and $17.76 with a 10-yr. guarantee. The board did not consider this bid, owing to its informality, but was prepared to award the contract to the Barber Asphalt company. The objection of the property-owners, however, to paying what they considered an exorbitant price led the board to reject Oct. 19 all bids offered.

Ft. Washington, D. C.—Bids were received Oct. 10 for furnish ng 2,000 bbls. of Portland cement as follows: New York & Rosendale Cement company, New York, Brooklyn Bridge brand Port., 69¾ cts. per bbl.; Lawrenceville Cement company, New York, Beach brand Port, 68 cts.; Maryland Cement company, Baltimore, Md., Toltec brand nat., $2.15; Jas. H. McGill, Washington, Atlas brand, nat., $2.74. Bids were received also for furnishing broken stone as follows: Chas. G. Smith & Son, Washington, D. C., coarse broken stone, fine broken stone and granolithic broken stone, $1.32 a cu. yd. each; Washington & Potomac River Iron and Land company, Washington, coarse broken stone, $1.24, fine broken stone, $1.19 and granolithic broken stone, $1.

Lincoln, Neb.—Bids were received Oct. 2 for laying 5,038 sq. yds. of brick or asphalt on streets now paved with cedar blocks, as follows: Barber Asphalt Paving company, New York City, asphalt 2-ins. on 1½-in. binder, 10-yr. guarantee, using 2½-in. concrete above old base, $2; Hugh Murphy, Omaha, for same thickness of binder and wearing surface on 2½-in. broken stone on old base, 5 and 10-yr. guarantee, $1.49 and $1.75 respectively; 2½-ins. concrete on old base and 5 and 10-yrs. guarantee, $1.65 and $1.90; brick on sand filler, 1 and 5-yrs. guarantee, $1.15 and $1.29; with paving cement filler, $1.20 and $1.34; Des Moines Brick Mfg. company, Des Moines, Ia., brick pavements with sand filler and 5-yrs. guarantee, $1.09½ and $1.15; paving cement filler, $1.20 and $1.34.

Chicago, Ill.—Bids were received Oct. 15 for street paving aggregating about $500,-000. The bids show a marked decrease in cost. The Bermudez Asphalt company was the lowest bidder, 10-yr. guarantee, for asphalt paving on the following: Oak-st., $1.65; Schiller-st., $1.69; Turner-ave., $1.67; W. Van Buren, $1.87. Contracts for paving 15 miles of streets, and aggregating $2,000,000, were awarded Oct. 21 as follows: Bermudez Asphalt company, nine asphalt, three granite and one cedar contract; R. F. Conway, three cedar, three asphalt and one macadam contract; Smith, Moss & Brown, two cedar contracts; James Conlon, one macadam contract; Henry Rath, one granite contract; Wm. Corden, one cedar contract; Sackley & Peterson, one macadam contract. All of this paving will be done before Jan. 1. The decision of the courts declaring the city's specifications for brick paving invalid made it necessary to reject bids for that class of paving, but the specifications will be changed and new bids asked.

## SEWERS.

### Sewers.

Newark, N. J.—The suit brought by the Marcus Sayre company and others for an injunction restraining the board of works from constructing the central relief sewer, according to plans adopted, has been continued until Nov. 25.

Sherman, Tex.—According to local press reports the proposition made by George W. Rush and associates, of Philadelphia, to put a sewerage system in this city has been accepted. The system will involve an expenditure of nearly $100,000. A. A. Fielder, mayor.

Washington, D. C.—Captain Lansing H. Beach, engineer commissioner of the District of Columbia, made a recent inspection of sewer and water works in the Northern states. Congress has appropriated $25,000 for the preparation of plans for a sewage pumping station, and Capt. Beach's trip was for the purpose of seeing the latest improvements in machinery for this work.

CONTEMPLATED WORK.

Owego, N. Y.—Surveys are being made for the extension of the sewerage system.

St. Cloud, Minn.—The estimated cost of the proposed ravine sewer is $23,000.

Gloucester, N. J.—The construction of a sewer in Ridgway-st. is contemplated.

Grand Junction, Colo.—The construction of a sewerage system is contemplated.

San Francisco, Cal.—Plans have been adopted for a sewerage system in Cortland-ave.

New Haven, Conn.—The council has voted to expend $6,500 for sewers. J. B. Maloney, burgess.

Wolfville, N. S.—The question of sewerage is being considered for this town. Mayor Thomson.

Peoria, Ill.—The board of improvements voted, Oct. 17, to build the proposed sewer in Persimmon-st.

Topeka, Kas.—City Engineer Barnes is preparing to make surveys for the proposed sewer in North Topeka.

St. Paul, Minn.—The construction of a sewer on Cherokee-ave. is proposed, at a cost of $12,910.

Plainfield, N. J.—The construction of a storm sewer in Park-ave. is contemplated at a cost of $2,000.

Washington, Pa.—A number of sewers will be constructed next year. Geo. D. Jenkins, boro engr.

Utica, N. Y.—The construction of a new sewer in Neilson and Mills-sts. is contemplated. Ald. Luker.

Newark, N. J.—An ordinance has been passed to construct a pipe sewer in Jeliff-ave. Jas. M. Seymour, mayor.

Lincoln, Ill.—An ordinance was passed Oct. 10 for a sewer on College-ave., from Peoria to Keokuk-sts.

Chattanooga, Tenn.—The improvement of the Washington-st. sewer is contemplated, at a cost of about $10,000.

Webster, Mass.—The extension of the sewerage system, at a cost of about $20,000, is contemplated for next year.

St. Joseph, Mo.—The construction of 15-12-in. pipe sewers in two streets is contemplated. C. S. Sheperd, cy. clk.

New York City,—The local board of improvements, Borough of Bronx, has approved resolutions for sewers in several streets.

Sioux Falls, S. D—.The South Side Sewerage company has been incorporated by Park Davis, Adrian L. Peck and C. O. Bailey.

Galesburg, Ill.—City Attorney Boutelle advises special assessment as a means of paying for the proposed trunk sewer.

Davenport, Ia.—The construction of an intercepting sewer, at a cost of $150,000, is contemplated. Albert J. Smith, cy. clk.

East Hartford, Conn.—The construction of sewers, at a cost of about $35,000, is contemplated. Jos. O. Goodwin, town clk.

Marquette, Mich.—E. E. McIntosh, cy. engr., has been instructed to prepare plans and specifications for an 8-in. tile sewer.

Helena, Mont.—A resolution has been passed creating special improvement, district No. 6. Edward Horsky, cy. clk.

Carrollton, Mo.—Alex. Trotter, Thos. B. Goodson and Herman Davids are on the committee interested in the proposed sewerage system and paving. Wm. Riblett, cy. clk.

Napoleon, O.—The state board of health has approved, conditionally, a plan for sewage disposal for this city.

Buffalo, N. Y.—The sewer committee adopted a report Oct. 17 ordering a notice of intention for a new sewer in Emslie-st.

Syracuse, N. Y.—Bids will probably be asked soon for the construction of a trunk sewer in the First ward, at a cost of about $60,000.

New Hampton, Ia.—The construction of a sewer on Chestnut-ave., from Main to Hale-st., 990 ft., is contemplated. G. A. Hamilton, clk.

Grand Rapids, Mich.—The board of public works will readvertise for proposals for building the Myrtle and Turner-sts. sewer.

Binghamton, N. Y.—A resolution was passed by the council to construct a sewer on Clinton-st., between Front and Murray.

Macon, Mo.—The question of constructing a sewerage system is being considered. Col. Blees has donated $5,000 toward the improvement.

Springfield, O.—Dr. John Rodgers, H. H. Seys and Dr. A. H. Vance compose a committee to investigate the feasibility of erecting a sewage farm.

Kentville, N. C.—The board of trade is urging the town council to decide upon some plan of learning what the cost would be for sewering the town. .

Yazoo City, Miss.—L. G. Montgomery, chrmn., desires to correspond with reliable parties regarding the proposed construction of a sewerage system.

Haverhill, Mass.—Plans are being considered for a trunk sewer or sewage disposal beds for the new Hale hospital buildings, but no action has beeen taken.

Lake Linden, Mich.—The council has authorized President Heidkamp to secure the services of an engineer to furnish estimates of the cost of a complete sewerage system.

Monroe, La.—An election will be held Nov. 9 to vote bonds for the purpose of employing engineers to furnish plans for sewerage and water works systems, paving, etc.

Madison, Mo.—The question of issuing $50,000 in bonds for a sewerage system for the village is, according to press reports, being considered by the village board.

Winston, N. C.—The construction of a sewerage and water works system is said to be contemplated by certain northern parties interested in the proposed manufacturing plants to be built here.

Warren, Pa.—The subscription of $4,000 by four citizens, together with the $10,000 appropriated by the state, will be sufficient, it is thought, to begin building the sewage disposal plant.

Chambersburg, Pa.—A proposition of Chauncey Ives, C. E., of this city, relative to making a survey, maps and plans for a sewerage system has been referred to the street committee with power to act.

Rogers Park, Ill.—An ordinance was introduced by Alderman Hirsch Oct. 24 authorizing the extension of the north side intercepting sewer from Pratt-ave. to Bryan-ave., for the purpose of diverting the flow of all sewers along the north shore emptying into the lake. Bids will be advertised soon.

Youngstown, O.—City Engineer Lillie submitted a plan Oct. 17 for improving the sewerage system. His plan is to take the surface water from the region near Spring-

st. to Crab creek, and three methods are provided for doing this, the cheapest one involving an expenditure of between $4,000 and $5,000.

The question of issuing bonds for the construction of sewers and sewerage systems will be voted on as follows: Norfolk, Va., $105,000, Nov. 8; Independence, Mo., Nov. 1; Omaha, Neb., $50,000, Nov.; Baltimore, Md., $2,000,000 in November; Wellsville, O., $75,000, Nov.; Grass Valley, Cal., $40,000 Nov. 8; Dalton, Ga., Nov. 2.

South Orange, N. J. — Alexander Potter, C. E., of New York City, has submitted a report of a preliminary survey and the estimated cost of the proposed trunk sewer, to connect Newark, Irvington, Vailsburg, Millburn, West Orange and South Orange with tidewater. Mr. Potter advises that the outlet be at Bay Way, in Elizabeth, emptying into Staten Island sound. He estimates the cost, including survey, construction and right-of-way, at $109,000. The joint committee has directed him to make a survey and estimate of cost to each city and village of two little trunk sewers, one through Vailsburg and Irvington, and the other from West Orange through South Orange

Toronto, Ont.—City Engineer Rust submitted a report to the mayor, Oct. 17, upon the disposal of sewage. He recommends the adoption of the system of intercepting sewers, as recommended by Messrs. Hering and Gray, with some slight modifications, but believes that it would be advisable for the council, before incurring such a heavy expenditure, to obtain the opinion of a consulting engineer. Mr. Rust's estimate of the cost of the systems is favorable to intermittent filtration. His estimates are: Intermittent filtration, total cost, $1,730,000; cost of maintenance, $70,000. Precipitation works, total cost, $1,540,000; annual cost of maintenance, $105,000.

### CONTRACTS TO BE LET.

Albany, N. Y.—Bids are asked until Nov. 7 for constructing a pipe sewer in Quail-st. Thos. J. Lanahan, clk. bd.

Keokuk, Ia.—Bids will be received until Nov. 3 for constructing 474 ft. of 6-in. sewer. W. I. Johnston, cy. clk.

South Bend, Ind.—Sealed proposals will be received until Nov. 14 for building a brick and pipe sewer. L. A. Hull, cy. clk.

Cleveland, O.—Sealed proposals will be received until Nov. 9 for the Berea road masonry, grading, draining, etc. Julius C. Dorn, clk. bd. co. comrs.

East Cleveland, O.—Sealed proposals will be received until Nov. 5 for constructing sewers and their appurtenances in sundry streets and avenues. H. B. Chapman, vil. clk.

### CONTRACTS AWARDED.

Oshkosh, Wis.—The contract for building a sewer in Bowen-st. was awarded to John Rasmussen & Co.

Marietta, O.—The contract for constructing a sewer in the Fifth district was awarded Oct. 18 to Z. T. Darrow.

Syracuse, N. Y.—E. G. Gay & Co. was awarded the contract for pipe sewers in several streets for $5,572.

Sycamore, Ill.—The contract for the construction of a sewer was awarded Oct. 11 to P. J. McNulty of Chicago for $3,558.22.

Rochester, N. Y.—The contract for building the N. Clinton-st. sewer was awarded Oct. 4 to H. N. Cowles of $6,867.25.

Stockton, N. J.—B. F. Sweeten & Son, Camden, N. J., secured the contract Oct. 11 for a new sewerage system in this town.

Buffalo, N. Y.—John Harrer secured the contract, Oct. 14, for building a new sewer in Hampshire and Ferry-sts. for $34,800.

Hamilton, O.—The contract for constructing a sewer in Fourth-st. was awarded Oct. 18 to W. H. Louthan for $1,198.99.

Indian Orchard, Mass.—The contract for building a sewer has been awarded to R. D. Maynard of Springfield, Mass., for $2,397.

Concord, Mass.—The contract for the sewerage filtration beds has been awarded to J. W. Meskill, Everett, Mass., for $1,473.

Faribault, Minn.—The contract for constructing the East Side sewer was awarded Oct. 7 to O'Neil & Son, city, for $10,000.

Boston, Mass.—F. E. McCarthy was awarded a contract Oct. 7 for building sewers and drains in Richmond and Adams-sts. for $9,722.

Monmouth, Ill.—Brodin & Dungan secured the contract Oct. 14 for sewers as follows: W. Fourth-ave., $623; S. Fourth-st., $1,047.15.

Butte, Mont.—H. M. Stanchfield secured the contract for building a sewer in Park alley, from Oklahoma to Gaylord. for $2,932.

Columbus, O.—Bids were received Oct. 18 for building sewers in Spruce, George and Charles-sts., the lowest being that of I. O. Jones.

Greenville, Pa.—The contract for constructing the new East ward sewer has been awarded to J. Will Mitchell of New Castle for $2,365.50.

Galesburg, Ill.—The contract for constructing sewers on Beecher-ave. and Losey and Pearl-sts. was awarded Oct. 6 to Jas. O'Connor.

Burlington, Ia.—The contract for the foundations of the outfall of Valley-st. sewer was awarded Oct. 17 to N. S. Young, city, for $12,400.

Beloit, Wis.—The contract for building a section of sewerage on the West Side was awarded Oct. 11 to Richard F. Finley of Janesville, Wis.

New Haven, Conn.—John A. Doolittle & Co. secured the contract for a sewer in Sherman-ave., between Goffe and Henry-sts., for $6,176.50.

Evansville, Ind.—Michael Weber secured the contract Oct. 15 for building the main sewer in Washington-ave., from Garvin-st. to Linwood-ave., at 41 cts. a ft.

Madison, Wis.—The Reichart Construction company, Racine, Wis., was awarded the contract for constructing sewers in Lexington-st. at $5,650 and Lake-st. at $3,400.

Joliet, Ill.—The contract for constructing a sewer and connections in Division-st. was awarded Oct. 14 to Campbell & Dennis; Union-st. and Fourth-ave., John Fleming.

Albany, N. Y.—John Doyle was awarded a contract Oct. 17 for constructing a sewer in Third-st. for $3,137.30, and Michael Dollard a sewer in Second-st. for $2,016.16.

Cohoes, N. Y.—Bids were received Oct. 12 for building sewers in sec. 1, and, according to press reports, the contract was awarded to F. S. Aplett, Cohoes, for $29,734.35.

Somerville, Mass.—Contracts have been awarded for constructing about 2,000 ft. of 26x39-in. brick sewer, as follows: Section 1, F. F. Crimmings, $2,690; section 2, E. E. Trumbull & Co., $8,081.

Mobile, Ala.—The contract for the sewerage system was awarded Oct. 19 to T. J. Shea of Quincy, Ill., for $123,272.50. This bid was $7,000 less than the highest bid received, which was $130,500.

Moline, Ill.—The contract for macadamizing, curbing, drains, sewers and water mains on Twenty-fifth-st., in Reed & Ryder's addition, was awarded Oct. 7 to the Davis company for $13,000.

Quincy, Ill.—Sewer contracts were awarded Oct. 17 as follows: Kentucky-ave., E. Best Plumbing company, $629; Seventh-st. $1,317, Third-st. $2,405, Third-st. $1,810 and Ohio and Twelfth-sts., $1,329, Peter Simons.

Allegheny, Pa.—Sewer contracts in the Tenth ward were awarded Oct. 7 as follows: McKee-st. $1,058, Hall-st. $1,500, Watson boulevard $1,522, Sweeney & Houston; Osgood-st., Thos. Prosser, $483; Pennsylvania-ave., Sicilian Asphalt Paving company, $9,618.

Bellevue, Ia.—The contract for constructing the sewer was awarded Oct. 7 to M. Tschirgi, Jr., of Dubuque, at the following prices: Main sewer, 50 cts. per lin. ft.; catchbasin connections, 40 cts. per ft.; manholes, $20 each; catchbasins, $11.

Indianapolis, Ind.—The contract for building a main sewer in Michigan-st., from White river to Holman-ave., was awarded Oct. 19 to Gus Kothe at $4.07 a lin. ft. Local sewers were awarded to H. C. Roney at 55 cts. and W. C. Allen at $1.21.

Milwaukee, Wis.—Sewer contracts were awarded Oct. 12 as follows: Ziemer-st., 1,298 ft. brick and pipe, G. E. Zimmerman, $1.33 a lin. ft.; Grant-st., 658-ft. pipe, M. Chybowski, 99½ cts.; Newhall-st., 651-ft. pipe, Dan O'Driscoll, $1.12 a lin. ft.

Brooklyn, N. Y.—Bids were received Oct. 19 for the construction of a temporary private sewer in Eighteenth-ave., between Fifty-seventh and Seventh-fifth-sts., for the Disciplinary Training School for Boys, from fifteen contractors. The contract has not been awarded.

East Cleveland, O.—Bids were received Oct. 10 for constructing sewers in a number of streets and for a sewage disposal plant as follows: Sewage disposal plant—Herbert Tate, New York, $21,787; D. A. Tompkins company, Charlotte, N. C., $20,670. Sewers—Cleveland Contracting company, $11,515 and $9,609 respectively for sections 3 and 4; R. J. Clements, $14,309, $14,204; R. H. Gray, $13,134, $11,222; Wm. McDowell, $15,169, $11,984; The Northern Ohio Paving & Construction company, $15,997, $13,197; Ford P. Beers $14,178, $11,423; R. B. Burnett, $23,183, $17,884; Clements Construction company, informal, $13,188. The contractors bidding on the sewers are all of Cleveland.

## WATER-WORKS.

Alliance, O.—The council will purchase the water works plant for $198,000.

Appleton, Wis.—Judge Seaman appointed Herman Erb receiver of the Appleton Water works company Oct. 24. Default on the interest of bonds led to the action.

Superior, Wis.—The council voted, Oct. 4, to commence suit to annul the franchise of the Superior Water, Light & Power company, because of its failure to comply with the terms and conditions of the contract.

Baltimore, Md.—The state board of health has decided to institute criminal proceedings against all persons who permit the existence on their property of conditions inimical to the purity of the city water supply.

Santa Cruz, Cal.—The Holland Trust company, New York City, brought suit Oct. 14 in the United States court against the city of Santa Cruz and the Santa Cruz water works to foreclose a mortgage on a trust deed of water bonds to the amount of $103,000 with $30,900 interest.

Jersey City, N. J.—The United States government completed, Oct. 19, the construction of the new pipe line which is to supply Ellis Island with Pequannock water, secured from Jersey City mains. The government will pay this city $100 for every million gallons of water supplied to Ellis Island.

Brooklyn, N. Y.—Commissioner Dalton has outlined the improvements which he contemplates making if he is allowed the $1,500,000 appropriation he has asked for. His plans involve the following: Four 66-inch steel conduits from Spring Creek east to Milburn, $950,000; for improvements and increase to Milburn Pumping Station and plant, $100,000; for laying additional mains in city, $150,000; for lands to increase well pumping plants and to protect present source of supply from contamination, $150,000; for additional machinery, wells, engine houses, etc., at well pumping plants, $150,000; total, $1,500,000.

### CONTEMPLATED WORK.

Bridgeton, Me.—The council is planning for a new water supply.

Bay City, Mich.—The water board contemplates extending the water mains next year.

Frenchtown, N. J.—The question of securing a water supply is under consideration.

Hinton, W. Va.—The Hinton W. W. company desires estimates for a 1,000,000 gal. filter.

Detroit, Mich.—A new system of intake pipes is proposed, at a cost of from $40,000 to $120,000.

Norristown, Pa.—The town council contemplates the establishment of a municipal water plant.

Millvale, Pa.—The question of issuing $5,000 bonds for a new pump will be voted on in November.

McConnellsville, O.—An ordinance was passed, Oct. 17, for constructing a water works system. Mayor Weber.

Taunton, Mass.—An appropriation of $15,000 for boilers, etc., at the pumping station is reported.

Sherman, Tex.—An ordinance has been passed authorizing the issuance of bonds for water works and electric lights.

Sidney, N Y.—The Sidney Camp Grove association has decided to build water works and a light plant for its grounds.

Brazil, Ind.—This city will probably go to the Wabash river, a distance of 12 mis., for its water supply.

Jones, Mich.—(Special)—George V. Deal says this village has voted to put in a water and electric light system.

Pasadena, Cal.—An engineer will be employed to consult with City Engineer Clapp regarding a water works system.

St. Louis, Mo.—An ordinance has been passed providing for the erection of two additional pumping engines at the Baden pumping station. M. L. Holman, water comr.

Urbana, O.—The city council appropriated, Oct. 10, the sum of $300 to pay for the cost of preparing plans for a new water works system.

Columbus, O.—The board of public works, for the second time, rejected all bids for the proposed new storage dam, and will advertise again.

Little Falls, Minn.—This city has voted $60,000 bonds to purchase the present water works and electric light plant or build a new one.

Lancaster, Pa.—The report and plans for a 10,000,000-gal. filtration plant will be completed soon, according to press reports E. H. Frailey, supt.

Holyoke, Mass.—The board of water commissioners is considering plans for installing a filtration plant at an estimated cost of $50,000.

Barrie, Ont.—The question of issuing $100,000 bonds for the purchase of the water works plant and extension of the system will be voted on Nov. 14.

Bennett, Pa.—The question of issuing $25,000 bonds for additional machinery for the water works and electric light plant will be voted on Nov. 8.

Grand Rapids, Mich.—The committee has been authorized to engage an engineer to recommend the best method for increasing the capacity of the pumping station.

Salt Lake City, Utah—The council has appropriated $2,500 to pay for surveys for an additional water supply. Councilmen Robertson, Callister and Morris.

Reading, Pa.—An ordinance has been passed to call an election to vote on the question of a loan of $225,000 to erect a land filtration plant for the water supply.

West Springfield, Mass.—The water commissioners are reported as having decided to issue bonds to secure plans for an improved water works system. W. T. Smith, chrmn.

Washington, Ga.—The city council will issue bonds, according to press reports, to purchase the water works and electric light plant and to build a new sewerage system.

The question of issuing bonds for water works construction will be voted on as follows: Independence, Mo., San Pedro, Cal.; Cuyahoga Falls, O., Nov. 8; Lake Providence, La.

Charlotte, N. Y.—Press reports state that the citizens of this place have asked that another election be held to vote on the question of issuing bonds for a water works and electric light plant.

Charleston, S. C.—Messrs. Rhett, Lapham and Williams have been appointed a special committtee to ascertain the practicability of procuring a water supply of not less than 7,000,000 gals. a day.

Newark, N. J.—The board of works has authorized the sinking of as many additional wells as are necessary to meet all demands upon the city's water supply until the Pequannock plant becomes the property of the city in 1900.

The question of water works has been favorably voted on at the following places: Jonesville, Mich.; Manchester, Ill.; Whitehall, Ill.; Windsor, N. Y.; Florence, Col.; Fayetteville, Tenn.; Persia, Ia.; Tekamah, Neb.

Laurel, Md.—Engineer Adelsberger of Baltimore submitted plans Oct. 17 for the proposed water works. He estimates the cost at $33,000 and the running expenses and repairs of the plant at not more than $500 a year.

Lawrence, Mass.—The Massachusetts state board of health has recommended that the filter bed connected with the water works be covered to prevent the formation of ice on the bed and insure the proper working of the filter and the ability to clean it in winter.

Jamaica, L. I.—The Jamaica Water Supply company has issued $400,000 of 5 per cent. bonds, $250,000 of which will be used in retiring outstanding bonds and the remainder in the building of the proposed extension of mains to Queens and Hollis, etc.

The construction of water works systems is contemplated at the following places; Tullahoma, Tenn.; Tucson, Ariz.; Oakesdale, Wash.; Zumbro Falls, Minn.; Adair, Ia.; Woodlawn, Ala.; Harper's Ferry, W. Va.; Fresno, Cal.; Essex Junction, Vt.; Logan, W. Va.; Camden, S. C.; Sturgis, Ky.; Palmer Lake, Col.

CONTRACTS TO BE LET.

St. Paul, Minn.—Bids are asked until Nov. 7 for two tubular boilers for the Como Park pumping station. Matt Jensen, cy. clk.

Wynne, Ark.—Sealed bids will be received until Nov. 8, postponed from Oct. 15, for constructing a water works system. Wm. M. Kennedy, chrmn. bd. imp't dist.

Rock Hill, S. C.—Sealed proposals will be received until Nov. 15 for the construction and completion of certain additions to the existing water works. Frank Oleson, Secy. B. P. W.

Honolulu, Hawaiian Islands.—Sealed tenders will be received until Nov. 25 for cast iron pipe and connections. Jas. A. King, Minister of the Interior. Specifications can be obtained at the Hawaiian Consulate, 65 Wall-st., New York City.

CONTRACTS AWARDED.

Milledgeville, Ill.—The contract for water works has been awarded to J. L. White of Leonore, Ill., for $8,000.

Harrisville, N. Y.—The contract for construction of the w. w. was awarded to W. C. Seigrist of Utica for $6,752.

McLeansboro, Ill.—The contract for constructing the water works was awarded to Chas. A. Stookey of Belleville for $10,000.

Charlotte, N. Y.—The contract for building w. w. was awarded, Oct. 15, to M. B. Birdseye and R. B. Lewis, Fayetteville, N. Y., for $24,600.

Fitzgerald, Ga.—The contract for building a water works and electric light plant has been let to Moore & McRae of Atlanta.

Pueblo, Col.—The contract for constructing a 34-in. wooden supply pipe from the reservoirs to the pumping station was awarded to Richard Holmes and W. F. Allen of Denver at $1.25 a lin. ft.

## BRIDGES.

Jackson, Cal.—The county board has ordered plans prepared for a steel bridge over Jackson creek.

Camden, N. J.—Bids are asked until Nov. 9 for the improvement of the turning of the draw of the Federal-st. bridge over Cooper's creek. Dr. J. B. Davis, chrm. com. bd. freeholders.

Valencia, Kas.—The erection of an iron or steel bridge over the Kansas river is proposed.

Williamsport, N. D.—The erection of a steel bridge across Long Lake creek is contemplated.

Arcadia, Wis.—The erection of a steel bridge across the river is contemplated by the village board.

Independence, Mo.—The new bridge, which was recently built at Atherton at great expense, collapsed recently.

Lexington, Neb.—Bids are asked until Nov. 2 for building new bridges and repairing old ones. W. C. May, co. clk.

Livermore, Ia.—The erection of an iron bridge to replace the La Compte bridge is contemplated by the county board.

Olivet, S. D.—Bids will be received until Nov 11 for constructing two steel bridges. J. S. Mueller, co. audt.

Lexington, Mo.—Frank Bowman, secy., desires to correspond with bridge contractors regarding the construction of a wagon bridge.

Easthaven, Conn.—The construction of a drawbridge over the dike is contemplated, at an estimated cost of $10,000.

Wilkesboro, N. C.—Bids are asked until Nov. 7 for a bridge at Curtisford, Yadkin river, and for several smaller bridges.

Oakland, Cal.—Bids will be received until Nov. 7 for constructing the Webster-st. bridge over San Antonio Estuary. Frank C. Jordan, co. clk.

San Jose, Cal.—Bids will be received until Nov. 9 for constructing a bridge over Isabell creek on the Kincaid road. Co. supervisors.

Richmond, Ind.—The county commissioners are reported as having under consideration the erection of a bridge across the Whitewater river.

Pekin, Ill.—The Wrought Iron Bridge company, Canton, O., has been awarded the contract for building a bridge over the Mackinaw river for $4,200.

Norfolk, Va.—A resolution has been passed authorizing the board of street, sewer and drain comrs. to contract for a bridge over Smith's creek.

Norwich, N. Y.—Bids will be asked soon for designs and the construction of an iron bridge over the Canasawacta creek at W. Main-st. Highway, Com'n.

Dobson, N. C.—The construction of an iron bridge across Fish river, to replace the one destroyed by fire, is contemplated by the Surry co. bd.

Houston, Tex.—Sealed proposals will be received until Nov. 14 for the construction of a steel bridge over Buffalo bayou at the foot of Franklin-ave. I. A. Mullen, cy. engr.

Newark, N. J.—A resolution has been adopted by the freeholders to ask bids for a bridge, with stone abutments, brick arches and steel beams, across the Rahway river in South Orange twp.

Quebec, Que., Canada.—Sealed proposals will be received until Jan. 2, 1899, for the construction of a combined railway and highway bridge across the St. Lawrence river; Ulric Barthe, secy., Quebec Bridge company, ltd.

Cleveland, O.—Sealed proposals will be received until Nov. 5 for constructing the masonry substructure, foundations, etc., and reconstructing and rebuilding Center-st. bridge over the Cuyahoga river. Geo. R. Warden, dir. pub. wks.

Muskegon, Mich.—A committee has been appointed to decide on a location for a new wagon bridge to be built across the river near the Trading Post grounds. Supervisors C. S. Place and Wm. Matthews, members of com.

Cincinnati, O.—Sealed proposals will be received until Nov. 7 for the construction of the superstructure of a street railroad viaduct across the valley of Lick Run, east of the Little Miami river. Chas. G. Roth, clk. bd. of trus., comrs. of w. w.

Chicago, Ill.—Sealed proposals will be received until Nov. 30 for the removal of the Moline wagon bridge across Rock river and for the design and construction of a high bridge in its place. W. L. Marshall, maj. engrs., 1637 Indiana-ave. Sealed proposals will be received until Dec. 7 for substructure, superstructure and auxiliary work for the change of the Van Buren-st. approach span across the by-pass along the Chicago river. Jas. Reddick, clk. bd. trus. Sanitary dist.

## GARBAGE DISPOSAL AND STREET CLEANING.

Newton, Kas.—The construction of a garbage crematory is contemplated.

Gainesville, Tex.—The garbage crematory destroyed by fire Oct. 5 will be rebuilt by the council.

Oakland, Cal.—J. W. Northup has applied for a 50-year franchise to collect and cremate garbage.

Newton, Mass.—The question of building a garbage disposal plant is under consideration.

Bridgeport, Conn.—The contract for a garbage disposal plant will be let in a few weeks.

Mansfield, O.—The question of better methods for the disposal of garbage is being considered by the council.

Louisville, Ky.—The erection of an incinerating plant for the consumption of garbage is contemplated.

Hot Springs, S. D.—The City Garbage company has been incorporated by Alex McDonald of Omaha and Chas. L. Fargo of this city.

Mitchell, S. D.—Councilman Edwards and the board of health have been authorized to investigate the subject of a garbage crematory.

New Orleans, La.—Plans and estimates have been prepared by the city engineer for two additional garbage incinerators.

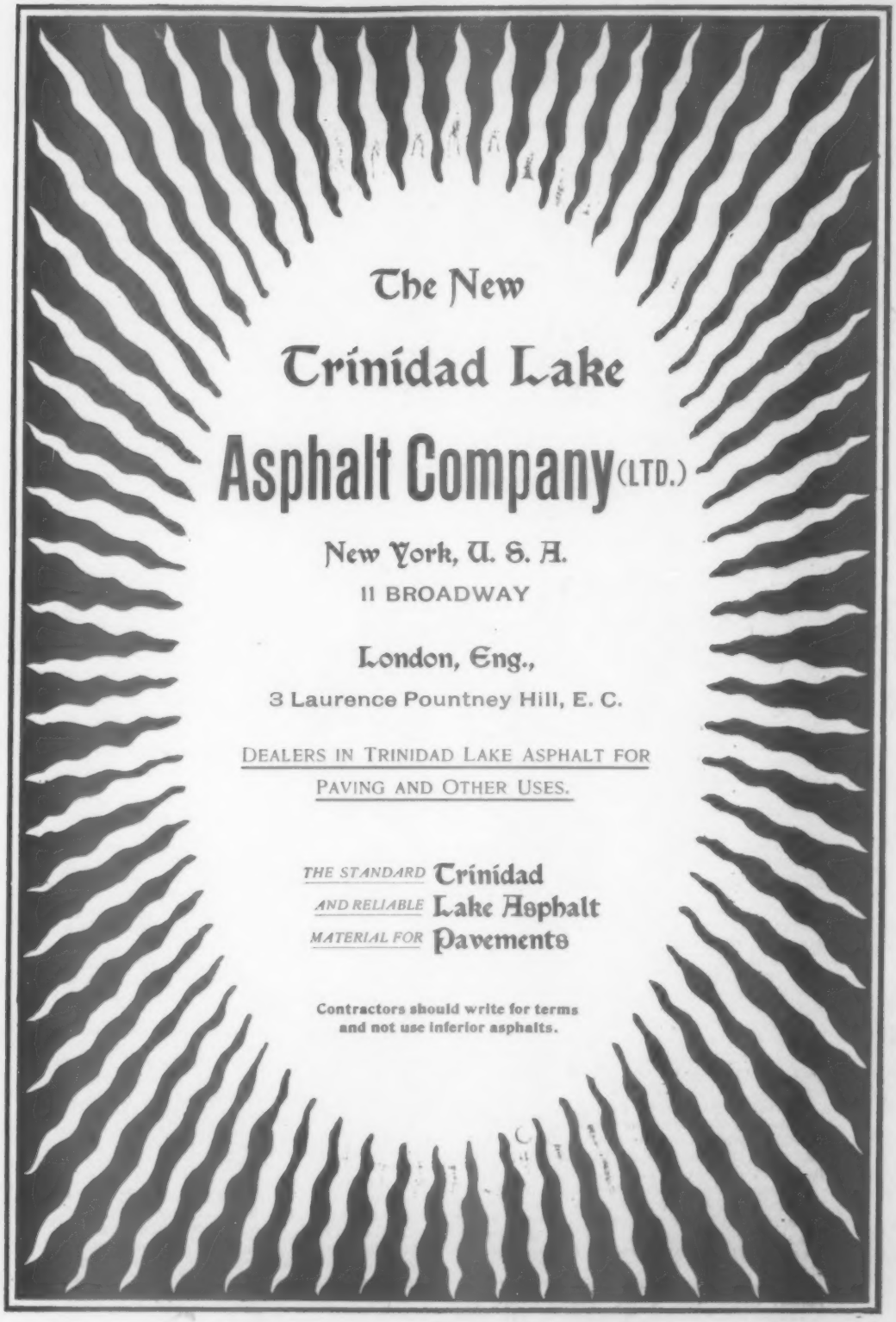
Atlanta, Ga.—The erection of two central crematories is recommended by the board of health. Lewis H. Jones, chrmn. com.

Norristown, Pa.—A proposition has been submitted to the board of health by J. L. Lemish of Phila. to receive and dispose of the garbage of this city.

Atlantic City, N. J.—The contract for a new crematory has been awarded to M. V. Smith of Phila. for $27,500, according to press reports.

Reading, Pa.—The contract for a garbage crematory has been awarded to the General American Reduction company of New York City.

(Continued on page 29.)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